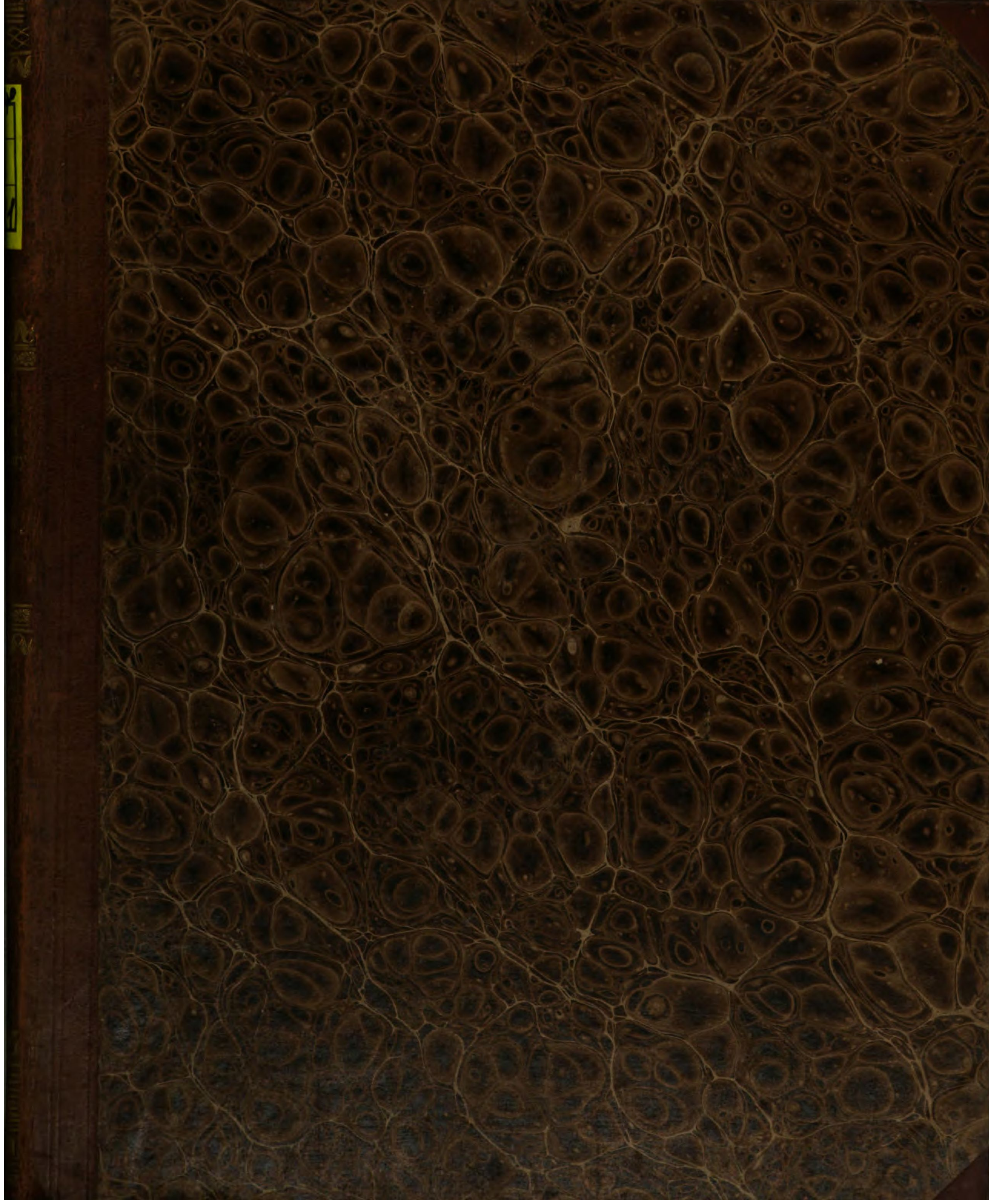
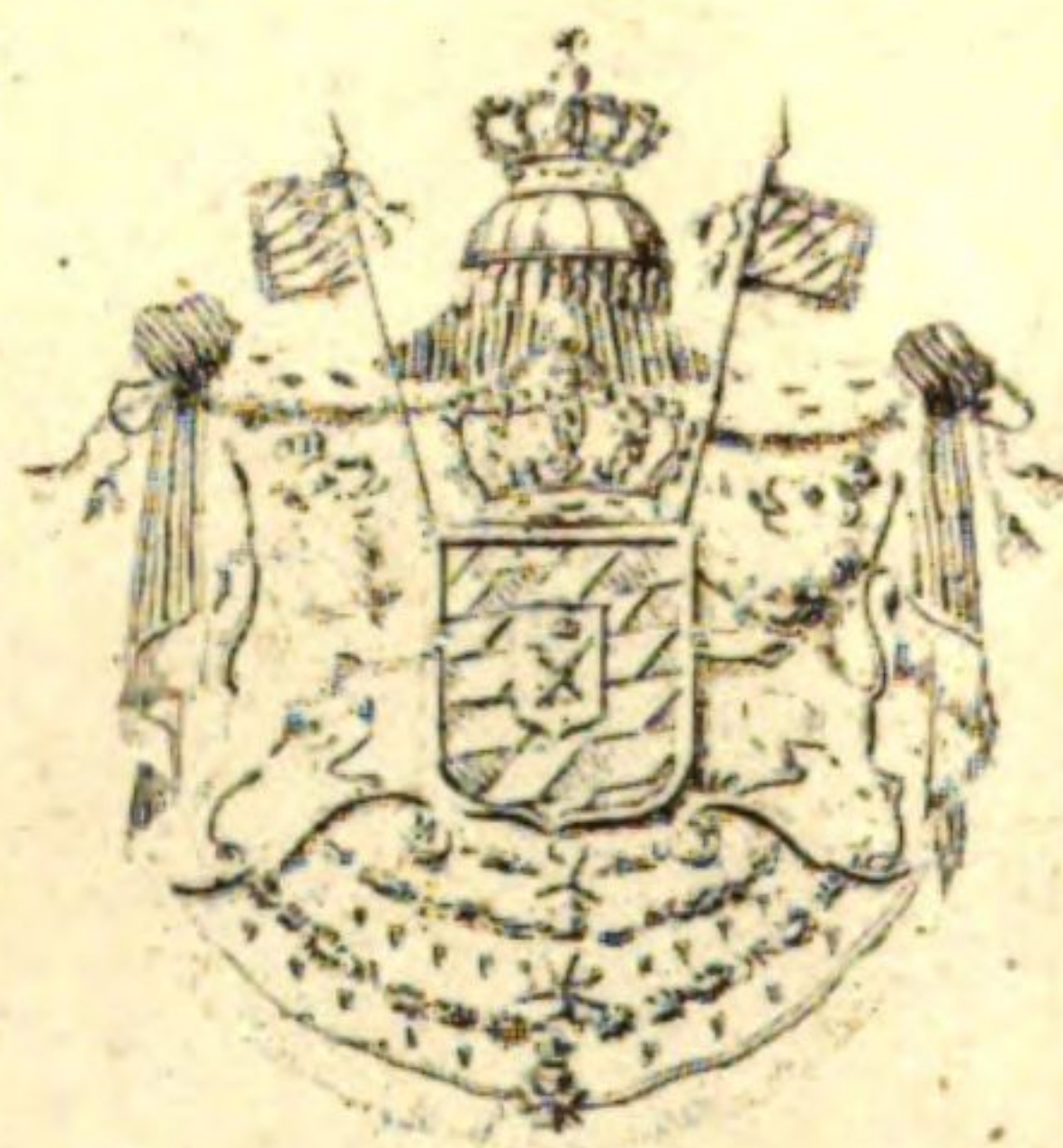




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A
NATURAL HISTORY
O F
F O S S I L S.

By EMANUEL MENDES da COSTA,

Fellow of the Royal and Antiquarian Societies of *London*, and Member
of the Imperial Academy *Naturæ Curiosorum* of *Germany*.

VOL. I. PART I.

*Multum egerunt, qui ante nos fuerunt, sed non peregerunt. Multum adhuc restat
operis, multumque restabit: nec ulli nato post mille sæcula, præcludeter occasio,
aliquid adhuc adjiciendi.*

L. A. Seneca, Epist. LXIV.

L O N D O N,

Printed for L. DAVIS and C. REYMERS, against *Grays-Inn-Gate*,
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Exhibited
Jan 10 1852

NATURAL HISTORY

FOSSILS

BY EMANUEL MENDES DA COSTA

Fellow of the Royal and Antiquarian Societies of London and Munich
of the Imperial Academy of Sciences, Government of Germany

VOL. I. PART I.

London: Printed for J. Davison and C. R. Knight, against Green-Pan-Gate, Strand, 1834.

LONDON

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P R E F A C E.

IN the Year 1752, I published proposals for printing by subscription, A Natural History of Fossils, digested from materials which I had compiled, during a series of years, wherein I had been closely engaged in these studies.

As the prosecution of the work was necessarily attended with great expence, I was obliged to apply for subscriptions, but on the most moderate advance, as the public already had too much reason to be tired with proposals of this nature.

Tho' the assistance I have hitherto received in this manner, is far from supporting the expence, yet, that I might not be wanting to those gentlemen who have favoured me with their subscriptions, I have published so much of the work, as the assistance I have received would enable me to do: the rest is ready for the press, and will be published with speed, proportioned to the generosity of those who think such researches worthy of encouragement.

In regard to the work, no pains or expence have been spared to render it as compleat as my abilities would permit: I have endeavoured to reduce this study, hitherto deficient in respect of method, to a regular science, and in the attempt have been careful neither to multiply the species, nor lessen their number, unnecessarily. To each genus, besides general observations, definitions or characteristics are adjoined, to which I have scrupulously adhered. I have added to the description of each species, the synonyma of authors, which, to avoid confusion, are placed in the order of time when they flourished. Foreign parts where these substances are principally found, are specified in particular, with the name of the province, principality, or town; a circumstance that has been omitted by former writers, who commonly content themselves with mentioning the country in general, as Italy, Germany, France, &c. and indeed where it happens that any Fossil abounds throughout a whole country, such a general account is sufficient.

I have at present but slightly touched upon the places in this island, famous for the Fossils; because they will be more fully considered in the *Lithographia Britannica* intended to be subjoined to this work.

To the descriptions are added historical facts, critical and other observations, which, 'tis hoped, will not be thought unnecessary, or foreign to the subject.

As I have availed myself of the labours and discoveries of preceding writers, so they have been faithfully quoted; and, however I may differ from them in opinion, I have endeavoured to treat them with a becoming regard.

In the course of the work I have been very cautious not to indulge a speculative fancy in forming hypotheses or systems, the bodies being simply described, according to the appearances which they exhibit to the senses.

I shall now give a brief history of the rise and progress of this study or science to the present time. Theophrastus, the disciple of Aristotle, is the first author extant, who has professedly written on this subject. Dioscorides, who flourished in the first century of Christianity, was the next; he treats only of the Fossil substances used in medicine: and Pliny, who lived some time after him, copied much from his works, and has handled the subject in a very superficial manner. So that from the conciseness of the accounts and descriptions given us by these antient authors, and the imperfect knowledge we have of the Fossils then in use, little benefit can now be reaped from their writings.

The decline of the Roman Empire, and the introduction of Gothic barbarity were as fatal to this, as to all the other sciences; and therefore, during that period we meet with no authors but a few alchemical writers of inconsiderable note. About the middle of the sixteenth century, Metallurgy began to make advances in Germany; Agricola, Encelius, Fabricius, Kentmann and Ercker, among the Germans; Peres de Vargas a Spaniard, and Cæsalpin an Italian, wrote about this time, and encreased the stock of knowledge by their excellent writings. From thence I think we may date the æra of this study, as it hath been cultivated by a continued succession of writers to the present time.

During the former part of the seventeenth century, many excellent authors wrote, some upon the science in general, as Imperatus, Aldrovandus and Mercator; others only on Metallurgy, as Lobneys, Cæsius and Barba; and several on particular parts, as De Boot, Baccius, Bartholine, de Laet, Wormius, Lachmund, with many others. Towards the close of the same century, when the origin of the figured bodies found in the earth was strongly debated by the learned, we find that Boyle, Lister, Grew, Plot, Woodward and Lhuyd, among the English; Petrus Borelli, Camerarius and Scheuchzer, among the Germans; Scilla, Boccone and Steno, among the Italians; and numbers of other learned writers flourished. The present age has added to the list the names of Butner, Mylius, Vallisnieri, Langius, Valentini, Henckell, Bruckmann, and others; and is still graced by many persons yet living and eminent in this branch of knowledge.

But of all those who have wrote upon this subject, none have attempted to reduce it to a regular science, except the celebrated Dr. Woodward, who published a method of arrangement founded on the growth, structure, and texture of Fossils. But a system which had only these principles for it's support, was found insufficient to distinguish the bodies of the Fossil kingdom with accuracy, and is pretty much exploded; while the method of dividing these bodies, according to the various changes produced on them by fire, into Calcarii, Apyri, Vitrescentes, &c.

&c. established by the Swedish and German authors, now universally prevails. The mineralogy of professor Wallerius is on this plan; but I could wish this excellent and learned author had been more full in his descriptions, and accurate in his arrangements.

I cannot avoid remarking, that there have been two works on this part of Natural History, published since Mr. Wallerius's mineralogy, and the more so as they are wrote in a systematical way. These are *A Natural History of Fossils* by Mr. John Hill, and the *Oryctologie* of Mr. D'Argenville; but the merits of these performances are not such as to require any particular account of them.

I have attentively examined the Woodwardian and Wallerian systems, and, finding them defective, have presumed to form a new one from the principles of both. I have endeavoured to arrange Fossils, not only according to their growth, texture, and structure, but also their principles and qualities, as discovered by the aid of fire, and acid menstrua: And in this way I am confident that all the known Fossils may be accurately distinguished; whereas, to attempt it by any one system hitherto followed, must occasion a strange confusion, of which 'tis needless to produce many instances here, as they occur in divers parts of this history.

It may however be observed, that as, on the one part, the texture, structure, and external appearances of the *gypsa striata*, the *asbesti*, and some striated spars are much the same, being all fibrose, yet they are bodies of very different orders: On the other side, the order of *Apyri* is too vague, since no substance whatsoever, that we are acquainted with, is, strictly speaking, unalterable by fire; for even the *asbesti* suffer changes by the solar heat; gypseous Fossils cannot properly be ranked under the *calcarii*, for gypsum and calx are as essentially different in their natures, as the *calcarii* and *apyri*. Further, the title of *vitrescentes*, if not per se, is certainly an imperfect distinction, in regard that all bodies are vitrifiable by the addition of other fluxing substances. Consequently while we have no fixed standard, or degree of fire that shall be the test of its powers and various effects on fossil substances, we go upon an uncertain and irregular plan.

The celebrated Mr. Pott in his *Lithogeognosie*, has, in my opinion, allowed too great a latitude to his system, built upon the essential or primary principles of Fossils, as discovered by chemical analyses. I am afraid that, should we adopt a system of this nature, we shall soon be forced to confess, that the immense variety in the works of the creation, all the objects of the three kingdoms would form but few genera; the animal kingdom would become one genus, and in some measure be confounded with the vegetable and fossil kingdoms: for it must be allowed, that if we extend this notion to the sublime philosophy of the primary elements of bodies, they will be found to be very few, though their combinations are infinite.

My

My system is simple, natural, and easy to be understood; the agreement between Fossils in their structure, texture, or appearance, is first noticed; afterwards their disagreements are considered, as they come to be examined by simple experiments, with fire, steel, and acids.

It has been by pursuing such natural and simple methods as these, that botany has so eminently raised her head above her sister sciences. A plain examination of the objects of nature, of the seeds, fruit, petals or stamina of plants, has given rise to the systems of the most famous and learned botanists. None of them have ever classed the plants according to their primary or essential principles: None have separated the esculent and poisonous into different genera, merely from an opposition in their qualities; nor have any, because of the superior specific gravity of iron-wood to water, ever excluded that tree from the vegetable kingdom.

And now I must own myself obliged, not only to my subscribers, as encouragers of this undertaking, but to all the gentlemen who have generously communicated their observations, or favoured me with specimens from their collections, such are Th. Pennant Esquire of Downing, in Flintshire; the Reverend Mr. William Borlase, of Ludgeon, in Cornwall; Mr. Anthony Tiffington, of Swanwich in Derbyshire; Mr. Thomas Knowlton of Loansborough in Yorkshire; Mr. G. Perry, of Coal-brook-dale in Shropshire; Mr. Turbevil Needham; Dr. Fothergill; James Bernard, Esquire; Gustavus Brander, Esquire, and many other English gentlemen; and of foreigners, Dr. J. J. Ritter, of Silesia; Dr. F. E. Bruckmann of Wolfenbuttel; Mr. Andreæ of Hanover, and Dr. J. Bohadsch of Prague, to all whom I here publicly return my sincere thanks.

If the work here presented to the public, receives encouragement, it is my full intention to pursue the plan through the whole Fossil kingdom, and in order to promote this design, I request the learned of all nations to assist me with their discoveries, which shall be always gratefully acknowledged.

Thus I submit my performance to the judgment and candour of the learned: If it meets with a favourable reception, I shall esteem myself happy in contributing thus far to the advancement of natural knowledge; but still more happy, as it gives me an opportunity of acknowledging the duty I owe to the Supreme Being, by endeavouring to display the greatness of his works in the subterraneous productions.

EMANUEL MENDES da COSTA.

London, June 5, 1757.

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Y R O T S I T O R Y T H E

NATURAL HISTORY

O F

F O S S I L S.

S E R I E S I.

E A R T H S.

C H A P. I.

*Earths naturally moist, of a firm texture, and which have a smoothness,
like that of unctuous bodies.*

G E N U S I.

B O L E S.

Earths moderately coherent, soft, composed of fine particles, smooth to the touch, easily breaking between the fingers, readily diffusible in water and freely subsiding in it. The Boles are slightly ductile but not viscid, nor do they burn to such a stoney substance as the clays, which are the distinguishing characteristics between the boles and the clays.

S E C T. I. *The White BOLES.*

M E M B. I.

Boles which are not acted upon by acids.

I. *Terra Lemnia alba.*

WORM. Mus. p. 9. Woodw. Cat. I. a 8 et 9. Dale's Pharmacol. p. 20. N^o. 3. Hill's Theophr. p. 126. note i. Bellonius l. i. Obs. c. 22. Imper. Hist. Nat. l. v. cap. 33. p. 127. Bruckman Epist. Itin. Cent. iii. Epist. 7 et 8. p. 48 et 49. et p. 68. Mercator Met. Vatic. p. 8 et seqq. et p. 23. aliorumque rubram recensentium.

Bolus alba levis, quæ Terra Lemnia alba, authorum. Hill's Hist. Foss. p. 3. N^o. 4.

Terra Sigillata Turcica alba. Mont. Exot. 14.

This is of a dirty whitish hue with an ashen cast, and has some very slight reddish streaks (1.) very heavy, not in the least unctuous or smooth, not even when scraped, but of a rough harsh surface, tho' it does not at all colour the fingers in handling, of a coarse firm texture, is difficultly broken between the fingers, very difficultly diffusible in water, as difficultly melting in the mouth, is extremely impure and gritty, has a fine adstringent taste, and scarcely adheres to the tongue if applied.

In burning it acquires a great hardness, and exteriorly is of a deep blackish brown, but interiorly it is of a deep brownish yellow colour.

It is dug in the island of Lemnos, now called Stalimene; the ancients knew this Lemnian earth as well as the red, but never brought it into use in medicine, probably because they thought the other superior to it in virtue, but used it as they did the cimolia and other white earths, to clean woollen and linen cloaths.

It is esteemed to be of great efficacy in dysenteries, hæmorrhages, and malignant fevers.

Mercator p. 9. gives an icon of a cup of *Terra Lemnia colore candicante, ac diluto rubro intermisto, aquæ e lotura carniû simillimo*, sent to Francis King of France by the Sultan, and presented by him to Pope Clement viith. Bellonius also mentions Lemnian earths, of a deep red colour, of a flesh colour, and white, all alike esteemed, and are found in the same pit, and Mercator received from thence little cakes of this earth, of those very colours.

(1). Several parts of the mass from whence this description was made, and which was taken forth of the pit in Lemnos by the Revd. Dr. R. Pococke, especially the surfaces, are covered with a reddish clay, not the *Lemnia rubra*, and Woodward's Specimen Cat. I. a. 8. which is also native, and just as it was dug up, exactly agrees with this, but his Spec. a. 9. which is dressed and washed, is milk white.

II. *Bolus Armena alba.*

Bolus alba purissima quæ bolus Armena alba authorum. Hill's hist. Foss. p. 2. N°. 1.

It is a fine soft and pure earth, moderately heavy, of a close compact texture, and very smooth surface, in colour of a clean bright white, it adheres firmly to the tongue, is very soft to the touch, but does not colour the skin in handling, it breaks easily between the fingers, melts slowly in the mouth, is insipid to the taste, and leaves an unctuous smoothness on the tongue, without giving the least harshness between the teeth.

Hill p. 5. N°. 8. justly observes, that the *Terra Eretria alba*, which was in high esteem among the Greek and Roman painters, is this very same bole.

Burnt by a moderate heat it acquires a considerable hardness, without any change of colour, and by extreme force of fire, is converted into a fine whitish grey glass.

It is dug in the eastern parts of Armenia, but in no great quantities.

It

It is esteemed a sudorific and an adstringent, but is unknown in our shops. Mercator Met. Vatic. p. 23. mentions a *Terra Eretria alba* dug from the iron mines of the island of Elba on the coasts of Tuscany.

III. *Bolus alba Lignicensis* vel *Goltbergensis*, *axungia Lunæ dicta*.

Schwenkfeld Foss. Silesiæ, p. 397. Hermannii Maslographia, p. 189. Wolkman Silesia Subter. pars ii. cap. 13. p. 275. et seqq. Kundman Rarior. Nat. et Art. Sect. i. c. 30. p. 244. et Prompt. p. 298. N°. 32. et seqq. et p. 299. N°. 56. Henric. Diff. de terris Medicat. Silesiæ. Worm. Mus. p. 10. Woodward's Fossils Cat. I. a. 14.

Bolus alba Lignicensis, *T. sigillata alba seu argentea*, *axungia Lunæ S. Argenti*, *minera Lunæ S. Argenti*, *Unicornu Minerale Lunæ*. Bruckman Epist. Itin. Cent. iii. Epist. vii. p. 61.

Terra sigillata alba S. Axungia Lunæ l. Argenti Goltbergensis. Idem. p. 60. N°. 1.

Bolus candidus Offic. Dale's Pharmacol. p. 19. N°. 8.

Argilla seu Bolus cinerea Axungia Lunæ. Linnæi Syst. Nat. p. 207.

Bolus albo grisea, pura, friabilis, quæ Terra Sigillata Goltbergensis auctorum. Hill's hist. Foss. p. 4. N°. 5.

This is, when fresh dug, of a pure white but becomes of a very dull pearly white, when exposed to the air, moderately compact and dense, light, somewhat friable, smooth to the touch, but not unctuous, it does not colour the hands, adheres firmly to the tongue, melts readily in the mouth, is insipid to the taste, and impure and gritty, it is readily diffusible in water, and is viscid and tenacious in some degree.

In the fire it acquires very little additional hardness and burns to a very pale whitish yellow.

It is dug about Goldberg, Strigaw, and Lignitz, in Silesia; in the latter place it is found in the silver mines, and Hill asserts, that particularly at this time it is dug in considerable quantities near Hasselt in the bishopric of Liege, in the circle of Westphalia.

It was imagined when first discovered to contain some particles of silver, for which reason Montanus named it *Axungia Lunæ*, and was supposed to have the same virtues as the medicines prepared from silver, but experience shews it contains not a particle of that metal.

It is now used in the shops as an astringent, a cordial and a sudorific.

Bruckman reckons the Goldberg and Lignitz earths as two different kinds, the Lignitz he says is white and friable, but in length of time becomes paler, the other he describes as shining, smooth or unctuous like soap or talc, and suffering no change in the fire, in which latter quality it agrees with the *Morochtus*, and Kundman, also exhibits them as two different species of boles.

IV. *Terra Noceriana alba.*

Terra Bezoartica di Nocera species Terræ Lemniæ. Paolo Boccone Mus. de Fis. et Esp. Osserv. 10. p. 63.

Terra Noceriana. Mont. Exot. 14. Dale's Pharmacol. p. 22. N°. 17.

Terra alba aquæ Nocerianæ S. Ter. di Nocera, et Terra Fionica Lundscharzensis. Bruckman Epist. Itin. Cent. iii. Ep. 7. p. 55.

Bolus alba ponderosa durior, quæ Terra Noceriana authorum. Hill's hist. Foss. p. 3. N°. 3.

It is a dense compact earth, very heavy, white, very smooth, does not break so easily as most other boles, nor does it colour the fingers in handling, When tasted it is perfectly insipid, it melts very readily in the mouth, and when suffered to break in it, leaves a lasting smoothness, tho' not without some little grittiness between the teeth, it adheres pretty firmly to the tongue.

In burning, it acquires a pure white, with very little additional hardness.

It is found at Nocera in Umbria, and is dug out of the hills nigh the mineral waters called L'Acqua Bianca or Acqua Santa di Nocera, which the inhabitants pretend derive its chief virtues by passing through the stratum of this earth. It is also found in some other parts of the ecclesiastical dominions.

The inhabitants of Nocera superstitiously dig it at the season of the year when the sun is in Leo. They dig it at about a foot depth, and find it mixed with soft stones and white lumps; they prepare it by carefully washing the gross parts away, and then form it into compressed cakes.

It is highly esteemed as endued with alexipharmic virtues, and an efficacious remedy against malignant fevers, heats of urine, bloody flux, &c. it operating by sweat as the animal bezoar.

Bruckman places with this earth a kind of Finland bole, which he calls, Fionica Lundscharzensis, and is sealed with a large rose having a star in its centre.

V. *Terra Sigillata alba.*

A fine and somewhat unctuous earth, smooth, pale or of a dull white colour, very compact, firm and heavy, it does not colour the fingers, adheres firmly to the tongue, melts slowly in the mouth, is insipid to the taste, but not quite pure or free from grittiness, and leaves an unctuous smoothness or fattiness on the tongue, it diffuses readily in water, and when moist is tough and viscid.

In the fire it acquires very little additional hardness, and changes its colour to a pale white, with a very slight tincture of yellow.

It is made up into small flat cakes, the impression two olive branches round the edges, tied by a knot at bottom, and in the middle Terra Sigillata.

SECT. I. MEMB. II.

Alkaline Boles.

VI. *Terra Eretria.*

PLINY l. xxxv. Dioscorides et Galen, Dale's Pharmacol. p. 20. N°. 4. Imperat. hist. Nat. l. v. c. 10. 14 et 15. l. iv. ch. 16. Charlton de Foss. p. 220. Mercator Met. Vatic. p. 16 et p. 23.

Terra Eretria cinerea ultra Marina qua medici utuntur. Kentm. Nom. Rer. Foss. p. 1. N°. 8.

Bolus alcalina subcinerea, quæ terra Eretria authorum. Hill's hist. Foss. p. 5. N°. 8.

It is a fine and pure earth, of a greyish white, moderately heavy, and of a smooth surface, not colouring the hands, and readily crumbling between the fingers, it adheres firmly to the tongue, and melts easily in the mouth, leaving a lasting smoothness on it, without the least harshness between the teeth.

It burns to a perfect whiteness, and to a great hardness, and acquires an acrimonious taste.

What abundantly distinguishes it from all other earths is, that if a little wetted and drawn over a plate of brass or copper so as to mark a line, the mark will in a little time appear bluish. The reason is its being an alkaline earth, and as all alkaline salts readily draw a blue tincture from that metal, it is evident that this earth possesses that quality in a degree much superior to chalk, or all other alkaline earths, which have not this strange quality.

It is dug in the Negropont, near the antient Eretria, and might be had in quantities if it were brought into use in medicine, as it antiently was, and its peculiar alkaline quality might very well recommend it to be at present.

Agricola mentions this earth to be found in a lime stone quarry at Hanover, which, says he, marks a violet coloured line on brass.

The ancients were extremely careful in their manner of preparing it for use; a description of the method is given at large by Dioscorides, and amounts to a very fine way of levigating, analogous to that by which we now prepare testaceous powders. It stands recommended as a noble astringent and sudorific.

VII. *Bolus alba Sigillata.*

Bolus alba ponderosissima mollis quæ Terra Melitensis officinarum. Hill's hist. Foss. p. 4. N°. 7.

This is a hard, dense and very weighty bole, of a close compact texture, of a pale white or cream colour, its surface smooth, and somewhat unctuous; it does not colour the hands, is friable, adheres very firmly to the tongue, melts pretty readily in the mouth, is fatty or greasy to the taste, slightly astringent, and leaves a pretty deal of grittiness between the teeth, it is readily diffusible.

diffusible in water, with some ebullition, and when moist is extremely viscid and tenacious.

In the fire it acquires some additional hardness, and burns to a pale ashen white, with a very slight reddish cast.

It is dug, says Dr. Hill, in many parts of the island of Malta, but on what foundation the Dr. grounds his assertion, is to me unknown, since certain it is by all accounts and authors, even the most noted Italian authors as Aldrovandus, Imperatus, Boccone, Mercator, Monti, &c. no other figillated earth is found in that island than the Terra S. Paolo, which is an earth of another genus, and to be described hereafter.

VIII. *Terra Sigillata Etrusca alba.*

Terra Sigillata Florentina alba. Kundm. Prompt. p. 296. N°. 6.

Terra Lemnia delle Montagne di Siena. P. Boccone Mus. di Fis. et di Esp. Osservat. 9. p. 61.

Terra Sigillata alba Magni Ducis. Mont. Exot. 13. Dale's Pharm. p. 21. N°. 8.

Bolus pura albo-sublutescens, quæ terra alba Magni Ducis authorum. Hill's hist. Foss. p. 4. N°. 6.

It is a moderately dense and compact bole, very ponderous and unctuous, of a dullish white, but becomes whiter as it dries, does not colour the hands, nor does it easily break between the fingers, it adheres tho' slightly to the tongue, melts very readily in the mouth, and is very pure and free from grittiness.

In a moderate fire it burns to a pure white, without any considerable additional hardness.

On account of its appearance and ponderousness Boccone thinks it to contain metalline particles, and certain it is, says that author, that mines of iron and quicksilver have been discovered in the mountains where it is dug.

It is found in the mountains of Siena, two miles distant from the abbey of St. Salvatore, seven miles from the fortress of Radicofani, and five from Santa Fiora, in a district called Il Podere Nuovo, which lies on the side of Mount Tinni or d'Amiata, over against Radicofani, and is dug in plenty; it lies about a foot deep, and was first discovered in 1675, it is also found in other places of the Dukedom of Tuscany. Dr. Hill asserts it to be found particularly in the neighbourhood of Florence, where there is a stratum of it, of eight or ten feet thick, at the depth of five or six feet from the surface.

It is esteemed a sudorific and an astringent.

IX. *Terra Sigillata alba.*

This is of a pale yellowish white, or near a pale straw colour, the yellow cast being pretty strong, it is moderately heavy, of a very loose friable texture, of a dry surface, but not harsh, having a very slight smoothness with it; it colours the fingers very much, and readily crumbles into powder; it adheres pretty firmly to the tongue, melts readily in the mouth, has a fine astringent

astringency, leaves no fatness or smoothness whatsoever on the taste, but is harsh and somewhat gritty. It diffuses very slowly in water, and falls into loose powder, and when moist has neither viscosity or tenacity.

In the fire it acquires no hardness, but rather becomes more friable and burns to a fine flesh colour.

X. *Terra Sigillata alba.*

This is of a dull pearly white colour, rather light than heavy, of a moderately compact texture and hardness, smooth and somewhat unctuous; it does not colour the hands, it adheres firmly to the tongue, melts readily in the mouth, is fat to the taste, and somewhat astringent, and leaves a considerable gritt. It is immediately diffusible in water with a very strong ebullition, and when moist is exceeding viscid and tenacious.

In the fire it acquires a considerable hardness, and burns to an ash colour.

XI. *Terra Sigillata alba Montis acuti authorum.*

Terra Strigoniensis alba. Mus. Richt. p. 145.

Terra Sigillata Silesiana. Imperat. hist. Nat. l. v. c. 36. p. 128.

Terra Sigillata Strigoniensis albida. Kundm. prompt. p. 299. N°. 47.

This is a fine pure earth of a pearly white colour, very heavy, compact and pure, somewhat unctuous or very smooth to the touch, it colours the fingers a little, is easily friable into a soft powder, adheres firmly to the tongue, melts readily in the mouth, and is very pure, fat, somewhat harshly astringent to the taste, and leaves some small grittiness between the teeth; it is readily diffusible in water, and is very viscid and greasy when moist.

In the fire it acquires some hardness, and becomes of a reddish or dark ash colour.

It is dug on Mount Georgenberg or Mons Acutus near Strigaw in Silesia, and is sealed with round headed hills, over which is a 'scutcheon with two de-cussated keys, and under it is written: *Terra Sigillata Montis Acuti.*

XII. *Terra Sigillata alba altera Montis Acuti.*

This differs from the foregoing in the following particulars, viz. It is of a clear white colour, is insipid to the taste, and leaves a considerable grittiness between the teeth; it is pretty readily diffusible in water with a considerable ebullition, it effervesces slightly with aqua fortis, whereas that ferments strongly with the same acid. It acquires no hardness in the fire and burns to a slight ash colour.

The stamp is exactly the same with the other, except that this has a large star on the left side of the 'scutcheon which the other has not.

Valentini Aurif. Med. p. 1. figures a stamp or seal like this among the *Terræ Silesiacæ.*

XIII. *Bolus alba Vulg. Offic.*

Worm. Mus. p. 8. Bruckm. Epist. Itin. Cent. ii. Ep. 95. p. 1204. N^o. 1.

Bolus candidus ex Ilva. Mercator Met. Vat. p. 23. Cæsalp. et Boccone Mus. di Fis. et Esp. Offerv. 7. p. 54.

Bolus alba friabilis. Hill's hist. Foss. p. 2. N^o. 2.

This is a very pure and soft earth, of a greyish white colour, of a moderately compact texture and weight, somewhat dry and dusty and in handling colours the skin, it is brittle and friable, it adheres but slightly to the tongue, melts slowly in the mouth, is insipid to the taste, and leaves a sensible tho' not very considerable grittiness between the teeth.

It is believed, says Bruckman, to contain some metallick, viz. a martial sulphur, and saline acid principles.

In burning it becomes whiter, lighter, and more crumbly then before, and acquires something of the acrimony of lime.

It is dug in the iron mines of the island of Elba, on the coasts of Tuscany, and according to Hill also near Francfort in the neighbourhood of Oppenheim, and in other parts of Germany.

It is esteemed a sudorific, alexipharmic and astringent; and according to Cæsalpin it is also used as fuller's earth in the place where dug.

Mercator recounts two accidental varieties of the Elba earth, viz. with veins of black, and variegated, or with veins of several colours.

S E C T. II. *The ashcoloured Boles.*I. *Terra Cimbrica cinerea.* Worm. Mus. p. 16.

THIS is an ashcoloured earth, very pure, fine, unctuous, and smooth to the touch, it adheres to the tongue, and is of an astringent taste, it is readily diffusible in water, and has not the least grittiness or impurity.

It is found in Cimbria, near the Promontory Bioerns-hoffnit in the district Hottersnen.

I do not doubt, says Wormius, this earth will prove a fine sudorific, and an excellent remedy in dysenteries and other fluxes.

II. *Terra S. Helenæ.* Worm. Mus. p. 10.

Charlton de Foss. p. 223. N^o. 11. Jacobæi Mus. Reg. Dan. p. 40. Bruckmanni Epist. Itin. Cent. iii. Ep. 11. p. 97. N^o. 20. and Magnal. Dei in Loc. Subter. Vol. I. p. 224.

This earth is of an ashcolour with a yellowish cast, fat and soft, more or less pure according as it is mixed with the sand wherein it is found; it is of a plated structure, it melts readily in the mouth, and has an astringent taste, which is more strong when crude, then when washed.

It

It is found at St. Helena, which is a medicinal water, in the Province of Seeland in Denmark, the veins of it are in a sandy soil, and cross other veins of a yellow ochre. Several people attribute the virtues of that water to this earth and ochre.

SECT. III. *The red Boles.*

MEMB. I.

Boles which are not acted upon by acids.

I. *Bolus Armena rubra.*

BOLUS *Orientalis quibusdam Armena.* Worm. Mus. p. 11. Aldrov. Mus. Met. p. 269. Kentm. Nom. Foss. p. 7. N^o. 6. Mus. Calceol. p. 111. Charlt. de Foss. p. 223. N^o. 2. Dale's Pharm. p. 19. N^o. 1. Joach. Camerarius's Obs. on this Bole. Grew's Mus. Reg. Soc. p. 349. Woodw. Cat. I. a. 19.

Bolus rubra durissima, quæ Bolus Armena Avicennæ et Bolus Armena rubra authorum. Hill's hist. Foss. p. 9. N^o. 1.

Terra Armena recentiorum et officinarum, sive Rubrica Synopica. Mercat. Met. Vat. p. 11. et 23.

This is of a deep red colour, hard, considerably weighty, and of a close compact texture, not unctuous or smooth but of a rough surface, and colours the hands : it is difficultly broken, melts readily in the mouth, is pure, soft, and astringent, it adheres firmly to the tongue, in water it raises an ebullition, but is not readily diffusible in it.

In burning it acquires some little additional hardness and a brighter colour.

It is dug in Armenia, but is seldom or never to be found genuine in our shops.

Rzacynski Hist. Nat. Poloniæ, p. 11. informs us, it is dug in the mountain Babiagora, beyond Cracow, and also in the Carpathian mountains ; Grew likewise exhibits an English bole like the Armenian, and Plott Nat. Hist. Oxfordf. p. 60. mentions a kind of *Bolus Armenus* dug up amongst the clay they use for bricks in the parish of Nettlebed not far from the Windmil ; also the Bole from New England, exhibited by Woodward, Cat. I. a. 7. is this very species.

It has ever been accounted an excellent astringent and alexipharmic, however Grew and Mercator seem not to be fully convinced of its virtues.

Hill, p. 14. judges the present Armenian bole to be the same as the *Lemnian Rubrica*, Μίλτ@ Λήμνια of Theophrastus. Matthiolus and Mercator think it approaches the *Rubrica Sinopica*, some authors seem to confound it with the yellow Armenian bole, and others pretend it is a Lemnian earth, but this latter opinion is justly exploded.

Camerarius describes a variety of this bole of a blackish red colour.

II. *Terra sigillata Turcica.*

Terra Turcica Offic. Dale's Pharm. p. 21. N°. 10.

Pastilli Turcicis characteribus insigniti. Worm Mus. p. 9.

An *Terra Lemnia.* Woodw. Cat. l. a. 11?

An *Terra Lemnia Carnea.* Bellonii l. i. Obs. c. 22. Mercat. Met. Vat. p. 8?

An *Terra Turcica ex flavo rubescens,* VALENTINI. Aurifod. Med. p. 1?

Terra Medicinalis Turcica colore carnea. Kundm. Prompt. p. 301. N°. 115.

Bolus friabilis griseo-rubescens, quæ Terra Sigillata Turcica authorum. Hill's Hist. Foss. p. 14. N°. 8.

This bole is of a pale flesh colour, not perfectly pure, nor of a very close or compact texture, tho' considerably heavy, soft, smooth and slightly unctuous, it breaks easily between the fingers, is immediately diffusible in water, melts readily in the mouth, is astringent, and gritty: and adheres but slightly to the tongue.

This earth, says Woodward, is the common sort of Lemnian earth, and forms a stratum which lies immediately under that of the *Terra Lemnia rubra* hereafter to be described.

It burns to a considerable hardness, and changes to a dusky yellow colour.

Its virtues, says Dale, are the same as the *Terra Lemnia*, for which it is commonly sold.

Bruckman, Epist. Itin. Cent. iii. Ep. 7. p. 43. N°. 4. exhibits seven species of red sigillated earths stamp'd with Turkish characters, and which he imagines may be Lemnian earths: he further observes, that he thinks very few of them are genuine, but that the Tyrolese, and others, impress with the Turkish seals, many earths which were never the produce of the Turkish dominions; for great quantities of these sealed earths are yearly brought to Ratisbon for sale.

III. *Bolus Virginiana.*

Bolus durior pallide et elegantissime rubescens. Hill's hist. Foss. p. 15. N°. 9.

Marga rubra particulis albis adpersa solido friabilis, red earth from the bank of Delawar. Bartr. § 9. Gronov. Ind. Supell. Lap. p. 103. N°. 1.

Woodw. Cat. l. a. 21. et 22.

This is an extremely fine pure earth, moderately heavy, of a compact firm regular texture and very hard, of a beautiful pale red or rose colour, variegated with veins of a deep red colour, and oftentimes large spots and veins of a bright yellow, and also of very small spangles of a silvery mica: it is of a perfectly smooth and glossy surface and does not colour the hands, it is difficultly broken, adheres exceeding firmly to the tongue, is difficultly melted in the mouth, is rough and of a stiptic astringent taste, and is perfectly pure, not leaving the least grittiness between the teeth; in water it is also difficultly diffusible.

In the fire it burns to an almost stoney hardness without any change of colour.

It

It is found in the banks of De la War river in Pensilvania, Dr. Woodward received it from Carolina, and Dr. Mitchell likewise informed me, that it is common in Virginia and many other parts of Pensilvania, so that, as Dr. Hill judiciously observes, it seems to be the product of most parts of America.

It has not yet been used in medicine, but seems much to deserve it, says Hill.

IV. *Bolus Anglicana rubra.*

Bolus fusca friabilis levis. Hill's Hist. Foss. p. 16. N°. 3.

This is a very elegant bole, of a dull red colour, veined and spotted with a fine greyish clay, it is of an exceeding unctuous and smooth surface very compact in texture tho' light and not hard, it adheres firmly to the tongue, melts readily in the mouth, is quite soft and pure to the taste, and is readily diffusible in water.

In a moderate fire it burns to a very considerable hardness, and dark dusky red colour.

It is found in several parts of this kingdom. I received it from Norfolk, and Dr. Hill mentions it particularly to be very common about Mount Sorrel in Leicestershire, near Bedford, and near Sherborn in Dorsetshire.

It has not yet been put to any use.

V. *Terra Melitensis rubra.*

Terra sigillata Melitensis rubra. Mus. Richt. p. 145.

Terra Melitensis rubra, diverso sigillo impresso. Bruckm. Epist. Itin. Cent. iii. Ep. 7. p. 51. N°. 7.

This is an earth of a fine deep red colour, ponderous, hard, of a very compact firm and regular texture, and somewhat laminated structure; of a very smooth glossy and near unctuous surface, and does not colour the hands: it is difficultly broken, adheres firmly to the tongue, melts readily in the mouth, is quite soft and of an astringent taste, and pure or free from any grittiness; it is immediately diffusible in water.

In the fire it suffers little change.

It is used as an astringent medicine.

It is said to be dug in the island of Malta, of which I am very dubious, for the same reasons alledged to the white Maltese bole, p. 5. N°. 7.

VI. *Bolus Bohemica rubra.*

Aldrov. Mus. Met. p. 271. Dale's Pharm. p. 19. N°. 2. Kentm. Nom. Foss. p. 7. N°. 4. Mus. Richt. p. 144. et 145. Bruckm. Epist. Itin. Cent. ii. Ep. 95. p. 1206. N°. 9.

The Bohemick sealed bole. Grew's Mus. Reg. Soc. p. 348.

Bolus flavo-rubicunda densa ponderosa, quæ bolus Bohemica authorum. Hill's Hist. Foss. p. 9. N°. 8.

This is a pure and fine bole, of a dense and compact but unequal texture, of a yellowish pale red colour, with some yellowish veins, heavy, of a smooth shining surface, it easily breaks between the fingers, it is not readily diffusible in water, nor does it melt readily in the mouth, but when dissolved has a fine softness, and an astringent taste, and leaves no grit.

In the fire it acquires a little hardness without any change of colour.

It is dug in the mines of Bohemia.

In the German practice it is greatly used for hæmorrhages, &c. and is esteemed to possess an alexipharmic virtue: in their dispensatory it is called *Bolus rubra officin.* Dale says it is also very common in our shops.

VII. *Terra Laubacensis rubra.*

Terra Medica Laubacensis rubra. Gronov. Ind. Supell. Lap. p. 103. N°. 3. Valentini Aurifod. Med. p. 2. Tab. 1. and in his appendix he re-publishes Geilfusius's treatise of this bole; the like does Liebknecht in his Disc. de Dil. Max. Kundman Rar. Nat. et Art. § 1. Art. 30. p. 244. et Prompt. p. 301. N°. 95. Liebknecht, Hassia Subter. p. 230.

Terra S. Lithomarga Laubacensis seu Labacensis Hassiæ rubra. Bruckm. Epist. Itin. Cent. iii. Ep. 7. p. 53. fig. 10. et Ep. 8. p. 68 et 69. N°. 3. et 7.

Terra sigillata Laubacensis rufa et Terra Sigillata Laubacensis ex rufo pallidior. Woodw. Cat. I. x^w. 7. et 8.

This bole is of a red colour, fine, soft, and unctuous, very tenacious or clayey, light and friable, is astringent to the taste, and adheres firmly to the tongue.

It is dug in great quantities at Laubac in Wetteravia, six miles from Frankfurt, and is dug from a mine called Bergkluft, which produces also other medicinal earths; they are all sealed alike with a shield, with a lion between two mountains; it is also dug on the Siegel Erdenberg, where with much trouble it is got from the fissures in the rocks, and from the fountain called Herrschaftlichen Born, it is sold, sealed and unsealed, and only by authority is prepared and sold.

It is esteemed a valuable astringent and alexipharmic.

The *Terra s. Marga Sigillata Laubana* of Bruckm. Epist. Itin. Cent. iii. Ep. 7. p. 64. Tab. 1. fig. 13. and some other German authors, is this same species, and differs not from it. This Lauban earth is found variegated with many different colours, as grey, bluish, green and white, but frequently is of a whitish red colour, its virtues are accounted the same as the Laubac bole. It is dug in the quarries of Mount Steinberg, where it is found lodged in the very stone in great plenty, it is prepared and sealed with a mountain and two large decussated keys over it, and under it *Terra Sigillata Laubana.*

VIII. *Bolus*

VIII. *Bolus rubra.*

This is an elegant and fine bole, of a beautiful bright red colour, with some few slight variegations of pale yellow, of a compact and regular texture, of a smooth and unctuous surface, and slightly colours the hands, it is hard and pretty weighty, it adheres very strongly to the tongue, melts readily in the mouth, is astringent to the taste, and is perfectly pure and soft, it is immediately diffusible in water, with a strong ebullition.

In the fire it acquires a great hardness and a darker colour.

I have received this bole from many judicious gentlemen, by the name of the true Armenian bole, and have also observed it in several collections with the same name, but it is not that bole, and I have reason to believe it is brought from some parts of the Turkish dominions, which likely has occasioned the error.

Bruckman Epist. Itin. Cent. ii. Ep. 96. p. 1211. exhibits two kinds of Armenian bole, viz. the common red bole, and a red bole elegantly variegated with flesh coloured veins or streaks; he adds, this latter kind is rare, tho' undoubtedly they are dug from the same pit. His latter sort by the synonym (for he describes it not) answers pretty much to this kind.

IX. *Bolus Hassiaca rubra.*

This is of a deep dull red colour, of a rough powdery surface, without the least smoothness and colours the hands, it is very friable and of a coarse loose texture, and adheres slightly to the tongue, it melts readily in the mouth, is fine and soft but somewhat impure, leaving a little grittiness between the teeth, and is immediately diffusible in water, with a strong ebullition.

It burns to a somewhat brighter colour.

I do not find this Hessian bole described by any German author.

X. *Bolus Turcica rubra.*

This is a harsh rough bole, not in the least unctuous or smooth, except when scraped, when it appears slightly so, it does not colour the hands, it is very heavy, tho' not hard, and is of a very deep red colour with a cast of brown, its texture is rough and compact, it does not adhere to the tongue, it melts readily in the mouth, has a slight astringency and such an acrid pungent stypticity, as to be quite disagreeable to the taste; it leaves a little grit, is immediately diffusible in water, and raises a strong ebullition.

It suffers little change in the fire.

This is a very peculiar earth and uncertain as to its genus, it somewhat approaching to the nature of the harder ochres, but as it partakes more of the nature of the boles, I rather chose to range it in this genus.

XI. *Bolus.*

XI. *Bolus Seichaviensis rufa.*

Terra obscure rubra Seichaviensis, de Seichaw, cum insignibus Falckenheinsibus. Bruckm. Ep. Itin. Cent. iii. Ep. 7. p. 63. Henric. diff. de Ter. Med. Siles.

Terra Sigillata Seichawer rufa. Woodw. Cat. I. x^w. 6.

A dense argillaceous earth, of a reddish clay colour, ponderous, of a smooth surface and somewhat unctuous, of a moderately compact and regular texture, and does not easily break between the fingers, it adheres to the tongue, does not very readily melt in the mouth, is pure and soft to the taste, and leaves no grittiness, in water it is not readily diffusible, and when moist is somewhat tenacious.

In the fire it acquires a redder hue and some additional hardness.

It is dug in Silesia and is used in the German practice.

S E C T. III. M E M B. II.

*Alcaline Boles.*XII. *Terra Lemnia rubra.*

ALDROV. Mus. Met. p. 262. Mercat. Met. Vat. p. 8. et p. 23. Worm. Mus. p. 9. Charlt. de Foss. p. 223. N^o. 1. Kentm. Nom. Foss. p. 3. N^o. 38. Dale's Pharm. p. 20. N^o. 2. Galen. Antid. et Med. Simpl. Avicenna l. ii. tract. 2. cap. 4. 9. Diosc. l. i. Pliny l. xxxv. c. 6. Bellon. Observ. l. i. c. 22. Imperati Hist. Nat. l. v. c. 1. 31. 32. et 33. p. 125. et seq. Grew's Mus. Reg. Soc. p. 384. Henschel. diff. 1 et 2. de Terra Lemnia. Amman. Manud. ad. Mat. Med. p. 8. et 9. Joach. Camerar. Obs. de. Ter. Lemnia.

Terra Sigillata Turcica rubra. Mont. Exot. p. 14.

Terra Lemnia rubicunda. Woodw. Cat. I. a. 10. et Cat. l. a. 10.

Argilla seu bolus Carneæ Terra Lemnia. Linnæi Syst. Nat. p. 207.

Terra Lemnia rubra, Γῆ Λημνία, Σφραγίς et Γῆ ἰερὰ. Hill's Theophr. p. 126. Note i.

Bolus ponderosa dura pallide rubescens, quæ Terra Lemnia rubra authorum. Hill's Hist. Foss. p. 13. N^o. 7.

Of a pale red colour, not pure, and is often variegated with spots and veins of a yellow earth, dense, very ponderous, of a pretty close compact and regular texture, smooth when scraped otherwise of a rough surface or not unctuous; it does not break readily between the fingers, nor does it colour the hands, it is slowly diffusible in water, melts very slowly in the mouth, and has a fine astringent taste, is somewhat gritty and adheres strongly to the tongue.

Kundm. Prompt. p. 296. N^o. 3. et 4. exhibits two varieties of this bole, viz. of a whitish red colour and of a florid red colour, which latter variety Camerarius likewise mentions.

In the fire it acquires a considerable hardness and burns to a fine deep red colour.

It

It is dug in the island of Lemnos, now called Stalimene; the pit is in a great plain; the stratum is horizontal, and about four inches thick; a stratum of a paler kind, the *Terra Sigillata Turcica* before described N^o. 2. lies immediately under this red kind; this pit is opened with great solemnity only once every year, which is on the sixth of August; Bellonius, and Albucarius who were sent by Aug. Busbequius, the imperial ambassador at the Ottoman court, and whose account both Wormius and Imperatus copy, (especially the former) give a succinct account of the ceremonies then used, and the earth supposed sufficient for the year's demand is taken out at that time, and is sold partly sealed and partly unsealed to the merchants.

Hill judiciously remarks the confusion even among the antient writers, concerning the Lemnian Sphragis or the sealed earth, and the Lemnian reddle; as indeed Salmasius had done before him in regard to Pliny's error on that subject.

It is an excellent astringent, sudorific, and alexipharmic.

It was greatly famed by the ancients as a sovereign remedy against poisons, the Turks still retain that notion; for on that account, the cups out of which the Grand Seignior drinks, are made of this red earth, which makes it rare to be had, it being reserved chiefly for the Sultan's use.

XIII. *Bolus Armena Lutea, vel Bolus Toccaviensis, vel Bolus Blesensis.*

Bolus Armena lutea. Mont. Exot. p. 13. Dale's Pharm. p. 19. N^o. 7. Aldrov. Mus. Met. p. 270. Mercat. Met. Vat. p. 11. et p. 23. Worm. p. 12. Imper. Hist. Nat. l. v. c. 12. et 28.

Bolus luteus Theophrasti. Kentm. Nom. Foss. p. 7. N^o. 3.

Bolus lutea purissima ponderosa, quæ Bolus Armena vera Galeni. Bolus Armena lutea authorum. Hill's Hist. Foss. p. 6. N^o. 1.

Bolus Toccaviensis. Worm. Mus. p. 11. Charlt. de Foss. p. 224. N^o. 3. Dale's Pharm. p. 19. N^o. 5. Schwenckfelt Cat. Foss. Siles. p. 370. Olig. Jacobæi Mus. Reg. Dan. p. 39. Mercat. Met. Vat. p. 12. Imper. hist. Nat. l. v. c. 35. et 46. Rivini diff. circa Ter. Med. p. 22. Fischer tract. de Ter. Med. Tockayensi.

Bolus Hungaricus. Crato. in Consil. l. iv. p. 532. 534. et l. vii. p. 777.

Bolus Pannonicus verus. Kentm. p. 7. N^o. 2.

Terra Medicinalis s. Bolus Toccaviensis vulgo Bolus Hungaricus. Bruckm. Epist. Itin. Cent. iii. Ep. 8. p. 69.

Bolus purissima lutea friabilis, quæ Bolus Toccaviensis authorum. Hill's Hist. Foss. p. 7. N^o. 3.

Bolus Blesensis. Dale's Pharm. p. 19. N^o. 4. Bruckm. Epist. Itin. Cent. ii. Ep. 96. p. 1214. et Cent. iii. Ep. 11. p. 93. Charas Hist. Nat. des Animaux, des Plantes, et des Mineraux qui entrent dans la composition de la Theriaque, p. 191. Mercat. Met. Vat. p. 12.

Bolus Sigillata Terræ Lemniæ congener seu Bolus Blesensis. Worm. Mus. p. 14.

Bolus purissima pallide flavescens levis, quæ Bolus Blesensis authorum. Hill's hist. Foss. p. 7. N^o. 2.

These.

These three boles, viz. the Armenian, Tockay, and that of Blois are of the same species, tho' hitherto described by authors as three different kinds.

These boles are of a pale red colour with an orange cast, that from Tockay has a much stronger red colour than the other two, of a close compact texture, hard, heavy; the Armenian and Tokayan are extremely smooth and soft to the touch, much more so than that from Blois; they do not readily break between the fingers nor do they colour the hands; in water they are pretty readily diffusible, they adhere firmly to the tongue, melt slowly in the mouth, are of a very astringent taste, and perfectly pure.

They all ferment violently with aqua fortis, and in the fire acquire a very considerable or almost stoney hardness, and a much darker red colour.

The Armenian is dug in Armenia, that of Tockay is dug in the hills on which the vineyards are at Tockay in Upper Hungary, as also all round that town and the river Tockay; and the Blois bole is dug at the village Orchese in the Orleanois in France.

These boles stand recommended as excellent astringents, alexipharmics, and sudorifics. Galen, who first brought the Armenian into use in the time of the plague of Rome, says, that it often cured that terrible disease, and adds those whom it did not cure, were relieved by no other medicine.

The Tockayan bole was first brought into use by Crato, who prefers it to the Armenian, and that of Blois is said to have been first discovered by one Guerin in the last century. Charas always used it in his Theriaca, and Wormius writes, he prescribed it with success in several diseases.

The clay found in a stratum which lay above the strata of stone at St. Agnes ball in Cornwall, exhibited by Woodw. Cat. c. a. 12. is of this kind but not so fine, as is also the bole from the East Indies, exhibited by the same author, Cat. l. a. 14. which, says he, serves for marking, and is found about three foot deep, having black earth over it, and a hard white clay under it.

Kentm. Nom. Foss. p. 7. N^o. 1. exhibits a *Bolus candidus Juliensis, ex luteo ad quandam rubedinem accedens, vero bolo Armenio non dissimilis*, which very likely is of this kind.

XIV. *Bolus rubra Silesiaca.*

Silesian Bole. Grew's Mus. Reg. Soc. p. 348.

This is a very fine bole, of a pale yellowish red or dull orange colour, of a compact regular texture, ponderous, smooth but not unctuous, nor does it colour the hands; it is of a middling hardness, adheres firmly to the tongue, melts readily in the mouth, and leaves some little grittiness between the teeth, is immediately diffusible in water, raises a pretty strong ebullition, and when diffused appears of a very yellow colour.

It is dug at Mons Acutus or Mount Georgenberg, near Strigaw in Silesia.

XV. *Terra*

XV. *Terra Sigillata Strigoniensis rubra.*

Schwenck Cat. Foss. Siles. p. 395. Bruckm. Epist. Itin. Cent. iii. Ep. 7. p. 57. Charlt. de Foss. p. 224. N°. 4.

Terra Sigillata quæ insigne Strigonianum præ se fert. Worm. Mus. p. 11.

A hard coarse impure bole, of a light red colour, the texture moderately compact and firm, it is also moderately heavy, of a tolerably smooth surface, but not in the least glossy; it does not easily break between the fingers, but slightly colours the hands; it is easily diffusible in water, melts readily in the mouth, has little or no astringency to the taste, and leaves a sensible grittiness between the teeth, and does not adhere to the tongue.

It ferments violently with acids, and in the fire acquires a considerable hardness without any change of colour.

It is an astringent, and is dug at Strigaw in Silesia.

XVI. *Terra Sigillata Goldbergensis rubra.*

Bruckm. Epist. Itin. Cent. ii. Ep. 95. p. 1206. N°. 12. et 13. et Cent. iii. Ep. 7. p. 60. N°. 2. Mus. Richt. p. 145.

Bolus friabilis levis sordide rubescens, quæ Terra Strigoniensis sigillata authorum. Hill's hist. Foss. p. 11. N°. 3.

This is a coarse earth, of a strong but dull red colour, not hard, of a moderately compact texture, heavy, not smooth or unctuous, not even when scraped; it does not colour the hands, nor does it adhere to the tongue; it melts readily in the mouth, and is extremely impure, leaving a great quantity of grit; in water it is immediately diffusible.

It ferments violently with acids; and burnt, acquires no additional hardness, but changes to a yellowish brown or clay colour.

It is dug in Mumelgrund Valley, and at Goldberg Mountain, where it is prepared and sealed, sometimes with a bird, but chiefly with three mountains and three trees, and a scutcheon over them, with a key and a sword decussated, and *Terra Sigil. Vera* underneath.

XVII. *Terra Sigillata rubra Montis Acuti.*

This is a coarse clayey bole, dense, heavy, hard, of a compact regular texture, of a dull red colour, smooth but not unctuous, and does not colour the hands; it adheres firmly to the tongue, melts readily in the mouth, is pure or does not leave any grittiness, and is readily diffusible in water, with a strong ebullition.

In the fire it acquires a considerable hardness, and burns to a duskier colour.

It is dug at Mons Acutus or Mount Georgenberg, near Strigaw in Silesia, and is one of the kinds sealed with hills and keys, and *Terra Sigillata Mont. Acut.* under them.

XVIII. *Terra Sigillata rubra altera Montis Acuti.*

This is an elegant bole, of a fine deep red colour, of a compact and regular texture, heavy, not hard, but easily breaking between the fingers, of a smooth surface, but not in the least unctuous, and colours the hands much; it adheres to the tongue, is immediately melted in the mouth, has a fine astringency, and is very soft, but not quite pure, it leaving a little grittiness; in water it is immediately diffusible.

Burnt, it acquires a considerable hardness, without any change of colour.

This is also dug at Mount Georgenberg in Silesia, and is another of the kinds, sealed with hills and keys and *Terra Sigillata Mont. Acut.* under them.

XIX. *Terra Sigillata rubra.*

This bole is of a fine red colour, of a compact and regular texture, ponderous, of a middling hardness, of a smooth surface, but not in the least unctuous; it breaks rough and slightly colours the hands; it adheres firmly to the tongue, melts readily in the mouth, is soft and astringent but very impure, leaving a great deal of grittiness between the teeth; it is immediately diffusible in water, with a strong ebullition.

Burnt, it acquires a great hardness and a very pale colour.

It is formed into a thick flatted cake, and is impressed with several hills with a large scutcheon, with a crescent and *Ter. Sigil. Vera* under them.

XX. *Terra Sigillata rubra Livonica.*

Worm. Mus. p. 12. Charlt. de Foss. p. 224. N^o. 6. Dale's Pharm. p. 12. N^o. 11.

An Terra Ilfana Livoniensis. Hoffman. in Clav. Schr. p. 139?

Terra rubra adstringens Livonica. Bruckm. Epist. Itin. Cent. ii. Ep. 95. p. 1206. N^o. 11. Olig. Jacobæi Mus. Reg. Dan. p. 39.

Bolus friabilis ponderosa rubra, quæ Terra Sigillata Livonica authorum. Hill's hist. Foss. p. 12. N^o. 4.

This is an impure heavy earth, of a dull red colour, tolerably smooth but not unctuous, of a loose texture, easily breaks between the fingers, and slightly colours the hands; it is immediately diffusible in water, melts readily in the mouth, with a strong astringent taste, and leaves a great deal of grittiness between the teeth; it adheres firmly to the tongue.

In the fire it acquires a considerable hardness, and becomes of a paler colour, with a strong cast of yellowish brown, and the minute micæ which are naturally mixed with this earth, then plainly appear like small spangles of silvery Talc.

It is dug in Livonia, and Hill says, it is also found very plentifully in Pennsylvania.

It

It is mentioned by authors to be a fine astringent, and good in diarrhoeas, dysenteries, and other distempers of the like kind.

XXI. *Terra Sigillata Etrusca rubra.*

An Terra Sigillata Florentina. Mus. Richt. p. 145?

This earth is of a deep dull brownish red colour, very pure and fine, ponderous and hard, of a compact and regular texture, smooth, but not unctuous, nor does it colour the hands; it is not difficultly broken, adheres strongly to the tongue, melts very readily in the mouth, is soft and astringent to the taste, and is perfectly pure, leaving not the least grittiness; in water it is very readily diffusible.

Burnt, it acquires a brighter red and a greater hardness.

It is dug in the neighbourhood of Florence, and I have likewise received this bole from Piedmont.

It is made up into very small flat cakes, and is impressed with a shield bearing a ducal coronet, the arms six byzants circularly ranged, and sometimes with a Jupiter and Leda.

Valentini Aurif. Med. p. 1. figures four cakes, with the first impression, which he calls *Terræ Sigillatæ Florentinæ*.

XXII. *Bolus rubra Gallica.*

Bolus rubra nostras. Ind. Med. 21. Dale's Pharm. p. 19. N°. 3.

Bolus ponderosa densa pallide rubescens, quæ Bolus rubra Gallica officinarum. Hill's hist. Foss. p. 11. N°. 2.

This earth is pure, very weighty, dense, of a compact texture, of a pale red colour variegated with veins of white and yellow clays, smooth, slightly unctuous, easily breaks between the fingers, but does not colour the hands, melts readily in the mouth, is soft and slightly astringent to the taste, and leaves a very slight grittiness between the teeth; it adheres pretty firmly to the tongue, is very readily diffusible in water, and raises a pretty strong ebullition.

In the fire it burns to a greater hardness with little change of colour.

It is dug in many parts of France; it is esteemed a good astringent, and is in constant use in that kingdom.

XXIII. *Bolus Lusitanica rubra.*

Bolus floride rubra ponderosa friabilis, quæ Terra Portugallica officinarum. Hill's hist. Foss. p. 13. N°. 6. Dale's Pharm. p. 22. N°. 16.

Barros f. Bucaros f. Terra Sigillata Portugallica. Bruckm. Epist. Itin. Cent. iii. Ep. 11. p. 95. N°. 10.

Vascula, ex Rubrica Synopica Lusitanicæ, sub nomine Boli Armeni ficta. Merc. D-2 Met.

Met. Vat. p. 23. *Vasa Figulina Lusitanica adversus venena*. Aldrov. Mus. Met. p. 229. *Pocula del Extreme in Hispania*. Worm. Mus. p. 346.

This earth is of a fine florid red colour, impure, of a regular but not of a close or compact texture, considerably weighty, harsh, dusty, colours the hands much; it is very friable, is immediately diffusible in water, and when thrown into it, raises a pretty strong ebullition; it melts readily in the mouth, has a strong astringent taste, and leaves a pretty deal of grittiness between the teeth, and adheres firmly to the tongue.

In burning, it acquires a little additional hardness and a brighter colour.

It is dug in the kingdoms of Portugal and Spain, all the soil round the town of Estremos in the Province of Alantego in Portugal abounds with this bole, as does la Maya a town some few miles distant from Madrid; it is also found near the Havannah and la Vera Cruz in New Spain, from whence vessels made of this earth are brought into Spain.

It is a valuable astringent, and an efficacious remedy for the cure of fluxes, and other distempers of the like kind. I have been informed by an eminent surgeon of this metropolis, that while the English fleet was at Lisbon, in Queen Anne's wars, the forces were greatly relieved by this bole, from the fluxes which then violently raged in the fleet. The Spaniards and Portuguese affirm it to be a sovereign remedy against poisons of all kinds; and their women often chew it to correct the acids, and for a dentrifice, for which it is greatly extolled.

The Portuguese and Spaniards also make an earthen ware of this bole, which they call Bucaros; the ware is of a fine red colour, very smooth and polished, tho' it is never glazed, being only dried; they use it to filtre, cleanse, and cool the water. The Bucaro of the Havannah and Vera Cruz, is esteemed the best, this of Estremoz the next, then that of la Maya, and that of Guadagara the least.

This bole is sometimes made up into cakes and stamp'd with a rose, says Dale.

The reddish brown crusty earth, used to colour the walls of the houses at Fort St. George in the East Indies, exhibited by Woodward Cat. I. a. 35. is of that species.

XXIV. *Terra Sigillata rubra.*

This is a bole of a fine florid red colour, very ponderous, of a pretty compact and firm texture, smooth, but not unctuous, and colours the hands much; it is easily broken, melts readily in the mouth, is soft and of a fine astringent taste, but impure, it leaving some grittiness between the teeth; it is readily diffusible in water, and adheres firmly to the tongue.

In burning, it acquires some little hardness, and a brown colour.

It is impressed with branches quite round the margins, and the word SIGILLADA, in large capitals, in the middle.

It is a valuable astringent.

XXV. *Bolus*

XXV. *Bolus rubra Indurata Helvetica.*

This is an elegant pure bole, ponderous, hard, of a close compact uniform texture, and indurated substance without any visible grain, but close and solid like a flint, and shatters or breaks like one; it is of a pale yellowish brownish red, of a smooth and glossy surface, and does not colour the hands; it adheres firmly to the tongue, does not melt in the mouth, and when broken between the teeth is fine soft and pure, or without the least grittiness; it is not diffusible in water, but when put into it, immediately divides into shatters; it effervesces violently with acids.

In the fire it acquires a redder hue, but no additional hardness. I received this bole from Switzerland.

SECT. III. MEMB. III.

Boles imperfectly described in regard to the effects acids have on them.

XXVI. *Bolus rubra Norwegica.*

TERRA Antiscorbutica. Worm. Mus. p. 16. Henr. Petraei Diff. Harmonic. de Scorbuto, p. 38. Valent. Aurif. Med. p. 4. Hoffm. in Clav. p. 139. Barthol. Med. Dan. Domestica, p. 108. Rivini diff. circa Ter. Med. p. 22. Charlt. de Foss. p. 225. N^o. 1.

Terra rubra f. Bolus Norwegicus. Bruckman Epist. Itin. Cent. iii. Ep. 11. p. 93. N^o. 7.

This is an earth of a yellowish red colour, very impure, not at all fat and unctuous, but coarse, and not to be work'd alone into cakes, it is not very weighty, is insipid to the taste, and leaves a pretty deal of of grittiness between the teeth.

It is dug near Bergen in Norway.

It is a fine alexipharmic and absorbent, and is greatly extolled by the authors who treat of it as an efficacious and valuable remedy against the scurvy; however, it is not yet admitted into the German practice.

XXVII. *Bolus incarnata.*

Marga Saxatilis incarnata. Worm. Mus. p. 6. Charlt. de Foss. p. 222. N^o. 4. Dale's Pharm. p. 23. N^o. 3. Bruckm. Epist. Itin. Cent. ii. Ep. 97. p. 1220. N^o. 2. et 3. et Ep. 94. p. 1196. N^o. 19.

This bole is of a flesh colour, impure, fat, smooth and somewhat unctuous, is ponderous, adheres to the tongue, colours the hands, and marks a yellowish line on paper.

It is dug in great plenty in the mountains of Bohemia; and Schwenckfeldt mentions it to be also found in the Lygian mountains in Silesia.

It is esteemed to have the same virtues as the Armenian bole, and is a good remedy in dysenteries, hæmorrhages, fluxes, &c.

Bruckm.

Bruckm. Ep. Itin. Cent. iii. Ep. 8. p. 72. N°. 26. et Magn. Dei in loc. Subt. vol. i. p. 89. exhibits a bole of this very species found at Coburg, the capital of the duchy of the same name, which proved an efficacious remedy against the epidemical dysentery, which raged in that city in 1724

XXVIII. *Bolus rubra Maslensis.*

Herman. Maslogr. p. 189. § 2. Kundm. Prompt. p. 299. N°. 66. Mus. Richt. p. 145. Bruckm. Epist. Itin. Cent. ii. Ep. 95. p. 1206. N°. 14. et 15. et Cent. iii. Ep. 7. p. 62. et Ep. 8. p. 71. et Magn. Dei in loc. Subt. P. ii. p. 846. Tab. 26. fig. 6.

This is a ponderous fat bole, of a fine red colour, extremely smooth and unctuous, it adheres to the tongue, melts readily in the mouth, and is extremely pure or free from any grittiness.

It is a valuable astringent, absorbent, and detergent, and, could it be nicely separated or cleansed from the other clays wherewith it is mixed, it would equal any other bole.

Mr. Herman first discovered it in 1710, in the bricks and tile clay pits, at Massel in Silesia.

Bruckman exhibits a variety of this bole variegated with red and white.

XXIX. *Terra bolaris Sachsenhausenfis.*

Bruckm. Epist. Itin. Cent. ii. Ep. 95. p. 1207.

This is an earth of a brownish red colour, very impure and gritty, of a middling smoothness, and colours the hands, and when fresh dug seems like a bole grossly broken.

It is hitherto used only as a marle to manure the lands, and is found to be excellent for that purpose.

It is dug eastward of Sachsenhausen, from a hill called Messenroderberg, situated between the villages Messenrode and Megaheydorn; it constitutes a stratum between five and six feet thick, and immediately under it lies a stratum of large masses of stone.

SECT. IV. *The yellow Boles.*

M E M B. I.

Boles which are not acted upon by acids.

I. *Terra Lemnia flava.*

BOLUS floride lutea dura, quæ Terra Lemnia flava Officinarum. Hill's hist. Foss. p. 8. N°. 4.

Terra Lemnia subflava, digitos tamen non inficiens. Bruckm. Epist. Itin. Cent. iii. Ep. 7. p. 44.

Terra

Terra Lemnia lutea instar Boli Armenæ. Bruckm. ibid. p. 49.

An Bolo Giallo. Imper. Hist. Nat. l. v. c. 26. p. 123?

This is a pure and very fine bole, of a bright, lively and florid yellow, approaching to the colour of the brighter yellow ochres; it is of a close, compact, dense texture, very heavy, and of a smooth glossy surface, hard, and does not easily break between the fingers, nor does it colour the hands; it readily melts in the mouth without any grittiness, and adheres firmly to the tongue.

In the fire it acquires a considerable hardness, and dusky colour.

It is dug in the island of Lemnos.

It is a sudorific, astringent, and vulnerary.

II. *Terra Sigillata Lignicensis lutea.*

Charlt. de Foss. p. 225. N°. 2. Mus. Calceol. p. 114. Worm. Mus. p. 14. Valent. Aurif. Med. p. 2. Ol. Jacob. Mus. Reg. Dan. p. 39.

Bolus Aurea friabilis, quæ Terra Lignicensis lutea autherum. Hill's hist. Foss. p. 8. N°. 5.

This is a fine pure earth, of a bright strong yellow or golden colour, of an uniform regular texture, but not very compact, being somewhat loose and friable; it is moderately heavy, of a smooth glossy surface, and does not colour the hands; it adheres firmly to the tongue, melts readily in the mouth, is soft and astringent to the taste, and is quite pure, leaving not the least grittiness between the teeth; in water it is immediately diffusible.

Burnt, it acquires a considerable additional hardness, and a fine red colour.

It is dug at Lignitz in Silesia.

It is in great esteem in the German practice, as a valuable astringent.

Bruckm. Epist. Itin. Cent. iii. Ep. 7. p. 60. exhibits a *Terra Sigillata flavescens, Goldbergensis*; and Kundm. Prompt. p. 298. N°. 38. also exhibits a *Terra Sigillata Goldbergensis aurei coloris*, both which perhaps are this kind of bole.

III. *Terra Sigillata Strigoniensis flava.*

Terra Sigillata Silesiaca, Sigillum Strigoniense, Axungia solis chymicorum. Worm. Mus. p. 12. Charlt. de Foss. p. 224. N°. 1. Dale's Pharm. p. 20. N°. 7. Schwenckf. Cat. Foss. Siles. p. 395. Wolckm. Siles. Subt. p. ii. c. 13. § 5. p. 277. Tab. 1. fig. 2. et seqq. Valentin. Mus. Museor. T. i. l. i. c. 1. p. 2. § 4. et Aurif. Med. p. 2. Koenig. Regn. Min. Sect. 4. p. 3. c. 2. § 1. p. 402. A. Berthold. de Ter. Sig. Germ. Woodw. Cat. I. a. 13. Henel. Silesiogr. renov. p. 360. Amman. Manud. ad Mat. Med. p. 10. Herman. Maslogr. p. 189. Rivin. diff. circa Ter. Med. p. 11. Kundm. Prompt. p. 298. N°. 44. et seqq.

Terra Sigillata Strigoniensis f. Schweidnicensis f. Silesiaca Terra Aurea, f. Adami f. Benedicta. Bruckm. Epist. Itin. Cent. iii. Ep. 7. p. 56.

Argilla seu Bolus flava axungia solis Linnæi. Syst. Nat. p. 207.

Bolus

Bolus luteo fusca, quæ Terra Sigillata Silesiaca authorum. Hill's hist. Foss. p. 8. N°. 6.

This is a bole of a deep dull yellow colour, smooth, dense, of a clayey or coarse, tho' of a moderately compact and regular texture, and considerably heavy; it is easily broken, does not colour the hands, adheres to the tongue, melts readily in the mouth, is astringent, and leaves some little grittiness; in water it is immediately diffusible.

Burnt, it acquires a great hardness and a fine red colour.

It is dug from the mountain Georgenberg, or Mons Acutus, near Strigau, in the principality of Schweidnitz in Silesia, and is found in the fissures and cavities of the rocks of the old deserted gold mines, heretofore work'd on this mountain.

It was first discovered and brought into use by John Montanus, physician to the emperor Rodolphus II. in 1568, and he afterwards, in 1585, published a 4to treatise, on this his new discovered bole.

It is greatly extolled by Sennertus, as a sovereign remedy against the plague, malignant fever, &c. it is a valuable astringent and alexipharmic, and is also celebrated as excellent against the most violent and corrosive poisons.

It is called *axungia solis* from its fattiness, and its yellow or golden colour, or from its being only found in or near gold mines, or rather from its being impregnated, as was imagined, with the sulphur of gold, to which all its virtues are attributed, but vainly, for by the strictest chemical trials, it contains not the least particle of that precious metal.

The Shotover clayey ochre, hereafter to be described, agrees with this bole in many chief particulars, so as to be near a-kin to it.

Of the very same species is the *Terra Veldensis*. Bayer. Oryctogr. Norica, p. 15. et Suppl. ejusd. p. 43. Tab. 1. fig. 1. Casp. Hoffman. Paralipom. Officinal. c. 45. p. 665. Bruckm. Epist. Itin. Cent. iii. Ep. 7. p. 65. et Ep. 8. p. 72. N°. 23. Act. Nat. Curios. Vol. II. App. p. 107.

Terra Vitriolata Sigillanda. M. Hoffman Flor. Altdorf. Dale's Pharm. p. 21. N°. 9. et Casp. Hoffman. l. c.

Terra Sigillata Norimbergensis s. ex Crypta Veldensi et Terra Veldensis ex luteo punicea prope Norimbergam. Auf. dem. Geisloch Kundm. Prompt. p. 301 et 302. N°. 98 et 134.

Bayer criticises on Hoffman, for calling this bole a *Terra Vitriolata*, for says he, the least particle of vitriol cannot be discovered in it by the strictest trials, and its virtues, which are the same as the Silesian bole, also clearly demonstrate it.

It is found in a great cave called the Geisloch, or Grauszeloch, half a mile from Velden in the Nurembergh territories.

It was discovered about the beginning of the last century, by a citizen of Herspruck, who prepared it and formed it into cakes, which he impressed with mountains, and *Terra Sigillata* under them.

Bruckm. l. c. N°. 24. exhibits a like earth from Mount Moritzburg also in the territories of the city of Nuremberg.

IV. *Terra Sigillata Livonica lutea.*

Aldrov. Mus. Met. p. 267.

Bolus flavo-rubicunda friabilis levis, quæ Terra sigillata Livonica auctorum.
Hill's hist. Foss. p. 9. N°. 7.

This is a pure fine bole, of a dull dusky yellow colour, with some faint blush of reddishness in it, considerably heavy, of a shattery friable texture; it is smooth and glossy, does not colour the hands, adheres strongly to the tongue, is readily diffusible in water, and melts quickly in the mouth, leaving no grittiness between the teeth.

In a moderate fire, it acquires some additional hardness, and a darker colour.

It is dug in Livonia.

It is esteemed a sudorific and an astringent.

Hill mentions, that in Spain and Portugal it is much in use, and that they make a kind of earthen ware of it, of which they are very fond; but the Dr. errs greatly, for this bole is not known in those kingdoms, and his error proceeds from his confounding it with the *Bolus Lusitanica rubra*, already described, or more likely with the *Terra Lusitanica lutea*, hereafter to be described, which is a quite different species of bole, tho' agreeing with this in many particulars.

V. *Terra Sigillata Arabica sublutea.*

Worm. Mus. p. 14. Charlt. de Foss. p. 225. N°. 3.

Terra Sigillata Arabica lutea. Ol. Jacobæi Mus. Reg. Dan. p. 39. Brückm. Epist. Itin. Cent. iii. Ep. 11. p. 93. N°. 2.

This is a fine pure bole, of a very pale straw colour, of a firm compact texture, light, not hard, smooth and glossy, and scrapes unctuous; it adheres strongly to the tongue, melts readily in the mouth, has a fine astringent and styptic taste, and leaves no grittiness; it is readily diffusible in water.

Burnt, it acquires a pale reddish colour, and a considerable additional hardness.

It is said to be dug in Arabia, from whence it is brought us; it is commonly made up into small globose cakes or pellets, and is sealed with Arabic characters, or with a crescent and a star.

It is a valuable astringent, and an excellent remedy in malignant distempers.

Grew, Mus. Reg. Soc. p. 348. exhibits a bole of a yellowish sandy colour, somewhat gritty and friable, which perhaps is of this species.

Bruckm. Epist. Itin. Cent. iii. Ep. 8. p. 72. N°. 25. also exhibits a *Terra Sigillanda pallide flavescens, ad Lemniam accedentem Baruthensem*, which probably may likewise be of the same species with this bole.

S E C T. IV. M E M B. II.

*Alcaline Boles.*VI. *Terra Lusitanica lutea.*

THIS is a ponderous dense clayey earth, of a dull deep reddish yellow colour, with spots and veins, of a black clayey substance, smooth and friable; it does not colour the hands, it adheres strongly to the tongue, melts readily in the mouth, is astringent to the taste, and extremely impure, leaving a great deal of grittiness between the teeth; in water it is immediately diffusible.

Burnt, it acquires a red colour, and a considerable additional hardness.

It is dug along with the *Bolus Lusitanica rubra*, already described, at Estremoz, in the Province of Alentejo in Portugal, and is greatly used for making earthen ware, of which they are very fond.

Its virtues are accounted the same as the red Portuguese bole.

S E C T. V. *The brown Boles.*

M E M B. I.

*Boles which are not acted upon by acids.*I. *Terra Sigillata Turcica pallide fusca.*

PASTILLI cinerei, litteris Arabicis insigniti, et Pastilli cinerei effigie Lunæ et trium Stellarum notati. Worm. Mus. p. 10.

An Terra Sigillata Arabica casia, Valentin. Aurifod. Med. p. 1?

Terra Sigillata Turcica fusca Lunæ et Stellarum figuras ferens. Mus. Richt. p. 145.

Terra Sigillata Turcica ex flavo-bruna, cum quarta Lunæ incurvatæ parte et tribus Stellis. Bruckm. Epist. Itin. Cent. iii. Ep. 7. p. 43. N°. 10.

Terra Sigillata fusca Arabica. Kundm. Prompt. p. 298. N°. 26.

This is a bole of a greyish brown or pale clay colour, very impure, having spots and veins of a white clay intermixed with it; it is of a coarse and not very compact texture, heavy, smooth, and slightly unctuous, it breaks easily between the fingers, is immediately diffusible in water, melts readily in the mouth, is astringent to the taste, and leaves a great deal of grittiness between the teeth, it adheres firmly to the tongue.

In the fire it acquires a considerable hardness, and a very dusky brown colour.

It is said to be dug in Arabia, and is brought to us formed into little globose cakes, which are sometimes sealed with Arabic or Turkish characters, sometimes with a crescent and three stars, and sometimes with a crescent and a star and six balls round the edges.

Dale,

Dale, Pharm. p. 21. N°. 9. reciting the kinds of boles, or *Terræ Sigillatæ*, which he had observed in the apothecaries and druggists shops, describes his first sort to be a greyish fat clay made up into little cakes or balls at Constantinople, and impressed with Turkish or Arabic characters, from whence it is brought us; this, tho' rarely found in our shops, says he, is the kind I think should be used, when the *Terra Sigillata* is prescribed, as it possesses the true virtues of the *Terra Lemnia*, and may justly be substituted for its succedaneum. I do not doubt this is the very bole thus described by Dale.

II. *Terra Sigillata Jauraviensis fusca.*

Mus. Richt. p. 145. Kundm. Prompt. p. 299. N°. 55. Bruckm. Epist. Itin. Cent. iii. Ep. 7. p. 63.

Terra Sigillata ex flavo-bruna Jaurowiensis s. Jaroviensis. Bruckm. l. c.

Bolus pallide fusca ponderosa densa. Hill's hist. Foss. p. 16. N°. 2.

This is an irregular argillaceous bole, ponderous, dense, of an unequal texture, being compact in some parts, and of a loose texture in others; of a brown colour, with a slight yellowish cast, exceeding full of small spots or spaces of other colours, as yellowish, greenish, purplish, &c. which form a pleasing variegation, but are only spots of other earthy substances; it is of a smooth surface, but not unctuous, breaks readily, does not adhere to the tongue, melts immediately in the mouth, is of a clayey taste, and very astringent; it is quite pure, not leaving any grittiness between the teeth; in water it is immediately diffusible.

Burnt, it acquires a considerable hardness, and a deep reddish brown colour.

It is dug in the principality of Jauer in Silesia, is a valuable astringent, and is used in the German practice.

III. *Bolus indurata fusca.*

Argilla indurata fusca, maculis nigricantibus variegata. Hill's hist. Foss. p. 26. N°. 1. and his Theophr. p. 126. Note i.

This is a fine bole, of a close compact uniform texture, rather light than heavy, and very hard; it is of a shining deep yellowish brown colour, mottled with deep black spots, its surface is smooth and very glossy; it does not colour the hands, nor does it melt in the mouth, but breaks freely between the teeth, has a slight astringency, and is quite pure or free from grittiness; it does not adhere to the tongue, and immediately shatters or falls to pieces in water, but is not at all diffusible in it.

What is very remarkable in this bole is, that tho' of so indurated and compact a texture, it shatters readily between the fingers, into regular sharp pieces of all sizes, and when but slightly wetted it does the same, which is owing to the various invisible cracks of which it is full in all directions; and to the mineral exhalations pervading those cracks, the black spots, which are always meerly superficial, are owing.

In the fire it acquires a great hardness, and a dark brown colour.

It is said to be found in the island of Lemnos, in the perpendicular fissures of the strata of stone, at four or five foot depth, in considerable plenty.

It has not yet got into use in medicine, but seems greatly to deserve it, says Hill, who adds, he has tried it with success in fluxes and hæmorrhages of many kinds.

Grew, Mus. Reg. Soc. p. 348. exhibits the hepatic bole of Lemnos, which seems to be this species: Mercator Met. Vat. 23. also mentions a *Bolus Jecoris colore ex Apulia*, which probably may also be of this kind.

Bruckm. Epist. Itin. Cent. ii. Ep. 97. p. 1222. N°. 26. described a brown marle not unlike the Lemnian earth, spotted or painted with black, found in the stone quarry at Lauben in upper Saxony; and in Cent. iii. Ep. 8. p. 69. N°. 4. he mentions a pure fat brown earth, intirely like the Lemnian, mottled with superficial black spots, sometimes it is also yellowish, and sometimes flesh coloured, from Laubac in Hesse Cassel, and l. c. p. 72. N°. 29. he exhibits a yellowish medicinal earth with black spots, from a clay pit at Dietfurt in the district of Pappenheim, all which said earths, I doubt not, are referable to this species of bole.

SECT. VI. *The green boles.*

MEMB. I.

Boles which are not acted upon by acids.

I. *Bolus virescens Anglicana.*

BOLUS *purissima virescens*. Hill's hist. Foss. p. 17. N°. 1.

This is a very fine pure bole, of a dusky olive green colour, and often acquires a brownish crust; it is of a close compact uniform texture, moderately heavy and hard, smooth, but not glossy nor unctuous; it does not colour the hands, adheres firmly to the tongue, melts readily in the mouth, is pure or free from grittiness, and of a nauseous astringent taste; is immediately diffusable in water, with a strong ebullition, and when moist is very tenacious.

Burnt, it acquires a great hardness and a liver colour.

It is dug in several parts of England, in the perpendicular fissures of strata of stone in Yorkshire, Devonshire, and Cornwall.

It has not yet been tried in medicine, nor indeed does it seem proper, says Hill, for internal use, since it manifestly owes its colour to particles of copper.

II. *Bolus Azureo-viridis.*

A Verdazurine Bole. Grew's Mus. Reg. Soc. p. 349.

This on the outside is of a blewish green like verdigrease, within of the colour of a leek; it adheres to the tongue, and hath the same taste as the Armenian or Lemnian.

SECT. VII. MEMB. II.

*Alcaline Boles.*III. *Terra Sigillata Viridis Arabica.*

THIS is a fine pure bole, on the outside of a deep dull blackish green, within of a fine deep tho' dull green colour, moderately weighty, hard, smooth but not glossy; of a compact uniform texture; it does not colour the hands, adheres exceeding firmly to the tongue, melts readily in the mouth, is of a disagreeable astringent taste, and quite pure; in water it is immediately diffusible with a strong ebullition.

It ferments violently with acids.

In the fire it acquires a considerable hardness, and a chocolate colour.

It is dug in Arabia, and is brought to us in globose cakes, impressed with Arabic characters, but does not seem very proper in medicine, as it manifestly partakes of copper, and to which it owes its colour.

S E R I E S I.

C A P. I. G E N U S II.

C L A Y S.

Earths firmly coherent, smooth to the touch, not easily breaking between the fingers, heavy, viscid, and ductile to a great degree while moist, not readily diffusible in water, and when mixed with it, not readily subsiding from it. This genus is the most unctuous of any of this series, and hardens by fire into a kind of stoney substance.

S E C T. I. *The Black CLAYS.*

M E M B. I.

Clays which are not acted upon by acids.

I. *Cimolia Nigra.*

CIMOLIA of a dark lead colour. Woodw. Cat. A. a. 1.

Argilla nigra quæ in igne candida evadit. Helwing's Lithogr. Angerburg. p. 13.

Argilla ponderosa nigra friabilis. Hill's Hist. Foss. p. 36. N°. 3.

This is a fine hard dry weighty clay, of a footy or dusky black colour, of a smooth compact texture, and not viscid or tough; when dry it is crumbly or friable, but does not colour the hands; it diffuses slowly in water, melts difficultly in the mouth, leaves no grittiness, and adheres firmly to the tongue.

In the fire it burns to a perfect whiteness, and acquires a considerable additional hardness.

It is dug in several parts of England; but near Northampton are the chief pits of this clay, at that place it is used for making tobacco pipes, which are as white as any in the world; it is also used in the making the hard reddish brown ware at Critche in Derbyshire, where it is mixed with the Critche clay, hereafter to be described in different proportions, as one fifth, a quarter, two fifths or three fifths, but most commonly in the proportion of one quarter part of this clay to three quarters of the Critche clay.

It is also dug in several parts of Germany, particularly in the territory of Angerburg in Prussia.

II. *Argilla nigra ponderosa.*

Argilla nigra ponderosa tenax, quæ terra Pnigitis Galeni. Hill's hist. Foss. p. 35. N°. 2.

This

This is a black, stiff, dense, compact clay, very heavy, moderately moist and ductile, and of a most tough viscid texture when fresh dug; when dry it is pretty hard, does not adhere to the tongue, is soft and smooth the touch, is not easily broken between the fingers, nor does it colour the hands; diffuses slowly in water, melts difficultly in the mouth, is perfectly pure or free from grittiness, is very viscid and slightly astringent.

In the fire it acquires a great hardness, and a reddish brown colour.

It is a good astringent.

It is dug in many parts of this kingdom; there is a stratum of it in the great brick clay pit behind St. George's hospital at Hyde Park, it lies twenty five feet deep; a stratum of a sandy earth, and another of loam lie over it.

Hill thinks that this clay is the Pnigites of Galen, and on this occasion remarks the confusion of writers on the Pnigites earths, the Pnigites of Dioscorides, l. v. c. 177. and of Pliny l. xxxv. c. 16. seems to be of the marle kind, as he justly observes, but is hitherto unknown to me. The Pnigites of Galen and P. Aegineta was this very species, consequently not the same as Dioscorides, and was even of a different genus. Agricola de Nat. Foss. l. ii. was the origin of the confusion of writers, when after having mentioned the black Pnigites, or the Pnigites of Galen, he proceeds with saying, that like to it is the black chalk. Imper. Hist. Nat. l. v. c. 20. p. 121. corrects Agricola, and proves the Pnigites of Dioscorides and Galen to have been different species of earths, and the black chalk to have been widely different from either; however, Agricola's error propagated, and Worm. Mus. p. 3. Charlt. de Foss. N^o. 3. and Dale's Pharm. p. 20. N^o. 5. confound the black chalk with the Pnigitæ of the ancients; and the latter author goes so far, as even to apply the virtues Dioscorides attributes to his Pnigites, to the black chalk.

Bruckman, Epist. Itin. Cent. ii. Ep. 94. p. 1197, 1198. and 1200. N^o. 34. 55. and 69. exhibits *Terra Argillacea nigra de Diet-furter-riet*, *Argilla nigra de Bornholm insula Dano-Balthica*, et *Argilla Nigricans Rodenbergensis*, which clays likely are of this species.

III. *Steatites nigra*.

This is a hard indurated saponaceous clay, of a bleuish black or deep lead colour, not very heavy, of a firm compact regular texture, smooth, glossy, and unctuous, not friable, nor does it colour the hands, but drawn along a paper, board, &c. marks a dusky blackish line like black lead; it does not adhere to the tongue, is not diffusible in water, nor does it melt in the mouth.

In the fire it acquires a stoney hardness, and an ashen colour.

This *Steatites* was sent from Pennsylvania by Mr. John Bartram.

Linnæus Syst. Nat. p. 156. N^o. 2. exhibits a *Talcum particulis impalpabilibus, solidum, nigrum, superficie Atra Glabra*, called *Hornberg*, and found plentifully in the mines of Sweden; and Wallerius Mineralog. synonyms it *Corneus durior, niger, solidus*, the earth which seems referable to this species of *Steatites*.

SECT. II. *The White Clays.*

MEMB. I.

*Clays which are not acted upon by acids.*I. *Cimolia alba.*

WOODW. Cat. A. a. 2.

Argilla ponderosa alba dura Cimolia alba officinarum. Hill's hist. Foss. p. 18. N^o. 3.*Argilla alba.* Charlt. de Foss. p. 218. N^o. 1.*Terra candida Saponaria seu Fullonia, Elbogiana.* Kentm. Nom. Foss. p. 1. N^o. 3.*Bolus seu Terra Sigillata Bobemica alba.* Bruckm. Epist. Itin. Cent. ii. Ep. 95. p. 1205. N^o. 3. and Mus. Richt. p. 145.

This is a dense compact heavy clay, of a pearl or dull white colour, of a close texture, hard, so as not to break easily between the fingers, smooth, unctuous, and slightly colours the hands; it adheres firmly to the tongue, melts very slowly in the mouth, leaves little grit, and is not readily diffusible in water.

Burnt, it acquires some hardness, with little change of colour.

It is dug in several parts of this kingdom, but chiefly in the Isle of Wight; it is used for making tobacco pipes, when mixed with the next following clay, as neither of them can well be worked alone.

This clay is also dug in some parts of Germany, and in Bohemia; in which latter kingdom, it is sealed and sold as a bole.

Dr. Woodward relates, that this *Cimolia alba*, as he was informed by Dr. Wyndebank, was one of the chief arcana of Sir Theodore Mayerne, in both intermittent and continuous fevers. The Bohemian bole is esteemed by the Germans as a valuable astringent.

II. *Cimolia alba altera.*

Hayter's clay. Woodw. Cat. E. a. 7.

Argilla levissima alba friabilis. Hill's Hist. Foss. p. 18. N^o. 2.

A fine compact clay, of a clearer white than the foregoing, pure, very smooth and unctuous, light, friable, and colours the hands much; it does not readily melt in the mouth, leaves no grittiness, and adheres firmly to the tongue.

In the fire it burns to some additional hardness, with little change of colour.

This clay is also dug in the Isle of Wight, where it is called Hayter's clay, and is used for making tobacco pipes, when mixed with one third of the foregoing

foregoing clay, for alone it cannot be worked, not having a due tenacity, and being so fine that it is apt to shrink in baking ; it is reputed to be the finest clay in England.

III. *Cimolia alba tertia.*

This clay is of a pale white colour, very compact and dry, it colours the hands much, is smooth but not unctuous, friable, adheres to the tongue, melts slowly in the mouth, is quite pure and free from grittiness, soon diffuses in water; and is very viscid or tough when moist.

It suffers no change in the fire.

It is dug near Lymington in Hampshire; it is also dug in some places in the Landgraviate of Hesse Cassel, where it is sold as a bolé, and is used in the German practice.

It has not yet been put to any use.

IV. *Cimolia alba quarta.*

Woodw. Cat. G. a. 4.

Argilla alba tenax. Hill's Hist. Foss. 19. N°. 5.

Bolus Boringholmicus. Worm. Mus. p. 8. Charlt. de Foss. p. 222. N°. 7. et

Argilla alba de Bornholm. Bruckm. Epist. Itin. Cent. ii. Ep. 94. p. 1198. N°. 54.

Bolus Norwagicus. Worm. Mus. p. 8. Charlt. de Foss. p. 223. N°. 8.

A fine stiff heavy clay, of a close compact texture, of a white colour, tho' slightly sullied, and is frequently tinged and veined with yellow; when moist it is extremely tough and viscid, even to a great degree; when dry it is very unctuous, hard, and does not break easily between the fingers; it slightly colours the hands, it adheres to the tongue, melts slowly in the mouth, is pure and quite free from grittiness; in water it is very difficultly diffusible.

In the fire it acquires a whiter colour, but no hardness, and the veins or streaks of yellow, burn to a pale red.

This clay is made use of to make the gally-pots at Vauxhall.

It is particularly dug from the banks of the river Medway, on this side Maidstone, in Kent, and in several other parts of this kingdom.

This species of clay is also dug in Denmark and Norway; the vessels made from it, says Wormius, bear a great heat, and for that reason, in the iron furnaces in Scania they mix it with old crucibles beaten to powder, and make excellent new ones of it.

V. *Cimolia alba quinta.*

A pure white clay, of a soft but close texture, and very fine; it colours the hands, and dissolves readily in water.

It burns to a great hardness, and a clearer white.

It is dug near Barnstaple in Devonshire, and is the clay used in making the famous Brosely tobacco pipes.

VI. *Argilla Sinensis.*

This is a pure fine clay, of a dull white colour, with some small spots of yellow, smooth, but not in the least glossy or unctuous; it colours the hands very much, adheres strongly to the tongue, melts easily in the mouth, is quite pure or free from grittiness, and diffuses readily in water, with a slight ebullition.

It burns to a greater hardness, and to a purer white colour; this is said to be the clay of which the China ware is made.

VII. *Argilla Sinensis altera.*

Argilla durior albo-cærulea tenax. Hill's hist. Foss. p. 92. N^o. 5.

A fine clay, of a pale bluish white colour, remarkably heavy, of a close, compact and even texture, smooth and glossy, not easily to be broken between the fingers, and does not colour the hands; it adheres firmly to the tongue, melts slowly and difficultly in the mouth, and leaves a slight grittiness between the teeth. Thrown into water, it makes no ebullition, but diffuses slowly, and in time wholly breaks in it, and is reduced to a substance like thick cream at the bottom of the vessel.

In the fire it acquires no hardness, and burns to a snow white colour.

This is also affirmed to be the clay of which the China ware is made.

VIII. *Argilla alba.*

A fine soft clay, of a dull white, inclining to an ash colour, of a close compact texture, of a smooth tho' powdery surface, and colours the hands much; it is not easily broken between the fingers, adheres but slightly to the tongue, melts difficultly in the mouth, is not pure or quite free from grittiness, and is readily diffusible in water, with a slight ebullition.

In the fire it burns to a darker colour, and great hardness.

It is dug near Tinmouth in Devonshire, and is now used for the making of porcellane at Vauxhall.

IX. *Argilla alba altera.*

A clay of a pearl or pale white colour, and is often tinged and veined with yellow, of a fine close texture, very unctuous, friable, and colours the hands greatly; it adheres to the tongue, melts readily in the mouth, is quite soft and fat to the taste, and leaves a slight grittiness behind it; in water it is readily diffusible.

It suffers little change in the fire.

It is dug at Benthall in Shropshire, where it is used to make the common white ware.

X. *Argilla*

X. *Argilla cæruleo-alba.*

This is a fine hard clay, of a blueish white colour, with veins and spots of a yellowish earthy matter, of a close compact texture, very heavy, of a smooth surface, but without any glossiness or unctuousity; it does not colour the hands, does not adhere to the tongue, melts readily in the mouth, and is extremely impure or gritty; in water it diffuses slowly.

Burnt, it acquires a great hardness, and a very pale yellowish colour.

I found this clay lying in veins and spots, in black-stone and lime-stone, at the depth of twenty eight fathom, in a shaft (then sinking for lead) at Matlock in Derbyshire; there were veins of a striated spar lodged in it.

XI. *Argilla indurata alba.*

This is a fine, hard, heavy, compact, milk white clay, but it is always tinged red, and is variegated with veins of that colour; it is slightly unctuous, does not colour the hands, does not adhere to the tongue, melts difficultly in the mouth, and is quite pure or free from grittiness; in water it is with great difficulty diffusible.

Burnt, it acquires a great hardness, but suffers no change of colour.

It is dug in many parts of Germany, and is a species of the *Margæ Medullæ Saxorum dictæ* of the German authors.

XII. *Steatites viridi-alba.*

This is a fine, soft, or saponaceous clay, of a greenish white colour, of a pretty close and compact texture, heavy, friable, does not colour the hands, is smooth but no wise glossy or unctuous; it does not adhere to the tongue, melts readily in the mouth, and is quite pure or free from grittiness; in water it is very difficultly diffusible.

It burns to a yellowish colour, but acquires no hardness; it is dug in Devonshire.

XIII. *Steatites quæ Paretonium antiquorum.*

Paretonium vel Paretonion. Plinii Hist. Nat. l. xxxiii. c. 5. et l. xxxv. c. 6. Aldrov. Mus. Met. p. 250. Mercat. Met. Vat. p. 18. et 23.

Argilla albissima ponderosa tenax, quæ Paretonium authorum. Hill's hist. Foss. p. 17. N^o. 1.

A fine white clay. Woodw. Cat. c. a. 13.

This is a beautiful snow white clay, perfectly pure and fine, very heavy, of a close compact firm texture, of a soft, smooth, glossy, unctuous surface, it easily breaks between the fingers, does not colour the hands, adheres slightly to the tongue, melts freely and quickly in the mouth, is quite pure or free

from grittiness, is immediately diffusible in water, with a slight ebullition, and when moist is very tough and viscid.

In the fire, it acquires a great hardness, and a duller white.

This clay is found lying in veins and loose masses, in the new soap rock at Gew Grez Cove, about a mile from the old soap rock in Cornwall, where it is also found running in veins, about two fingers in breadth.

Dr. Woodward found this clay, lying confusedly in a sinus of a rocky cliff, betwixt Tenby and Milford in Wales.

This would be a valuable earth for the making of porcelain, could it be got in quantities sufficient; however, the little which is procured from Cornwall, together with the *Steatitæ* from the same county, is applied to that use, at the new manufactory now established near Vauxhall.

Pliny has left us so exact a description of the Paretonium, in regard to its whiteness, fatness, tenacity, and smoothness (1), which are all characteristics of this clay, that no doubt can be raised of its being this very species. He informs us, the Paretonium had its name from a place in Egypt, where it was found, as it also was at Cyrene, and in the island of Crete; he further acquaints us, that it was believed to be the froth of the sea hardened with mud, for which reason it is found full of small shells.

It was in great esteem among the ancients, and was one of the native colours they used for painting on fresco; it seems to have been scarce among them, since the same author acquaints us, they used to adulterate it with the *Cimolia*.

(1) *Ecandidis coloribus pinguißimum et testoriis tenacißimum propter lævorem*. Plin. l. xxxv. c. 6. and *Parætonium quoniam est natura pinguißimum, et propter lævorem tenacißimum*. l. xxxiii. c. 5.

XIV. *Steatites vera.*

Woodw. Cat. A. a. 21, et 22. Grew's Mus. Reg. Soc. p. 321. Boet. de Lap. p. 416. c. 232. Aldrov. Mus. Met. p. 665.

Cimolia ad purpureum vergens. Plin. Hist. Nat. l. xxxv. c. 17. Mercat. Met. Vat. p. 17.

Terra Cimolia alia, ad purpureum vergens, ex Britannia et Ilva sub nomine Boli candidi et carnei. Mercat. Ibid. p. 23.

Ollaris fibris acerosis friabilibus incarnatus, Soapy-rock *Cornubiensibus*. Gronov. Ind. Supell. Lap. p. 12.

Pietra Saponale o Seuale, Imperat. Hist. Nat. l. xxv. c. 6.

Argilla indurata albo-purpurea lævis, Steatites recentiorum, Cimolia purpurascens antiquorum. Hill's hist. Foss. p. 22. N°. 11.

This is a fine and beautiful clay, of a firm, compact, and regular texture, considerably weighty and hard, of a smooth and unctuous surface, much more so than any other clays, from whence these kinds have obtained the name of soap earths.

It does not colour the fingers, but drawn along a board, &c. marks a white line; it does not adhere to the tongue, nor does it melt in the mouth, but

but when chewed, has an unctuous softness, and is quite pure and free from all grittiness; it is not at all diffusible in water.

The finest is generally white, sometimes with a yellowish hue, elegantly veined and spotted with different degrees of purple, from the slightest cast of that colour, to near black; at other times it is as elegantly variegated with red, and sometimes, tho' rarely, has veins and spots of green; at other times the ground is red or purple, variegated with white, but in all these appearances it so greatly resembles hard soap, that it has from thence more particularly obtained its English name of soap earth, or soap stone, and that of *Steatites*, from *στάσις*, fuet, from its resemblance to the hard fat of animals.

It does not cut evenly with the spade while in the vein, but breaks irregularly into lumps of different sizes.

In the fire, it acquires a stoney hardness, and a whiter colour.

As the texture of these soap earths is considerably hard, and that they have a great admixture of talc in their constitution, Imperatus first, then Grew, Linnaeus, and some other authors after him, range them among the talcy substances; but tho' from their great hardness, as Dr. Hill judiciously observes, they might appear not earths, but of a different class of fossils; yet, upon strict examination, they are found to have all the properties of a harder clay, and are therefore strictly and properly of the class of clays.

This earth was anciently found with the white *Cimolia*, in the island Cimolia, from whence its obtained its name; it is now found, tho' rarely, in several parts of Germany, and Mercator mentions it to be dug in the iron mines of the island of Elba, on the coasts of Tuscany. Dr. Woodward, and Gronovius, who errs in saying, it is the *Lapis Lebetum* of authors, exhibit it from Langron in Cumberland, where it is found among the iron ore; but the chief and only places discovered, where it is found in quantity, are the famous soap rocks, so called from this earth, near the Lizard point in Cornwall; and, as I find no description of those rocks in any authors, I shall add my observations on them, which I made on the very spots in 1749.

The soap earth, or *Steatites*, is found in a sandy creek, not much above a mile to the north west of the Lizard point; the sand is very smooth and pleasant, of a mixed colour, light and blue, and, when the tide is out, affords many turning and winding passages betwixt the rocks also blue, and the vast masses of cliff, which the violence of the sea has separated from their mother land, and from each other: there are also two grotts, one called Kynas hole, into which those sandy walks lead, but in them nothing remarkable is to be found, not even marine plants, it being altogether too often washed by the tide; on the surface of these rocks, there is sprinkled here and there a smooth, fat, and seemingly unctuous kind of incrustation, in colour and feeling much like to the natural appearance of bees wax, or tallow, and much of the same nature with the white part of the soapy rock, but whether it exsudes from the crevices of the rocks, several of which have little chinks, (filled with this heterogeneous matter) capable of emitting what they contain; or whether this substance is first washed off by the sea from those veins, and is again returned by the force of the waves, till it incrusts the rocks, time and further enquiries only can determine.

Most

Most of the stones within reach of the sea, are covered with an adventitious and most beautiful enamel; red, white, green, yellow, in thin lucid scales, sometime riding on one another in different crusts. In the eastern part of this cove, as the Cornish people call it, or creek, the substance of the rocks, and the sides of the cliff, is more gritty, and being soft, crumbling, and of a reddish colour, mixed with veins of white like marble; and the purest and most beautiful, lying in veins like metals. It is here more particularly called the soapy rock; as by its unctuousness, smoothness, and variegations, it greatly resembles the finest kind of soap.

The veins of *Steatites* are of different breadths; some run under the sea, some to near the top of the cliff, and some through the cliff up into the country; and seem in their course to cross the tin loads.

Nearer the Lizard than the soap rock, is another cove called Pintrith, which affords a greyish impure *Steatites*, spotted with black.

The new soap rock lately discovered, is at Gew Grez, or Crez cove, in the tenement of Kynas, in Mullion parish; it is about three miles from Mullion town, and about a mile from the old soap rock or cove, which lies farther southward. The entrance into the creek or cove is very steep, craggy, and horrid; on the right hand (in descending into the creek) the hills are crested with naked rocks or cairns, as the Cornish people call them; the sides have also many, but they are small; about half way down the cove, a very small current of water traverses it, in a very serpentine manner, and discharges itself near the load or principal vein of the *Steatites*. On the right hand, as you descend the cove, it grows more craggy and much narrower, and a few yards lower, on the same side, lies the main vein or load of *Steatites*; the various sorts are all blended together in spots, sometimes in greater quantities in one place than in another; in the white and red vein'd *Steatites*, peices of a compact, hard, slightly pellucid sparry substance are frequently found; the main vein or load is about eight foot over; it does not consist purely of the *Steatites*, but also holds quantities of rubble or fragments of a hard, smooth, dusky, greenish, and red coloured talcy-like fissile stone, called by the inhabitants a variegated Killas. Some small pieces of white spar are also met with, but rarely. About two hundred paces higher, on the left hand, I found a soft and very greasy straw coloured *Steatites*: in the sides of the country, that is of the solid strata which inclose the vein, and intermixed with it, lay a reddish brown *Steatites*, but the straw coloured kind was in the greatest quantity: further down, near the level of the sea, the *Steatites* load has been more regularly traced, and makes a course of about fourteen inches wide between regular sides: the left hand side the cove is quite perpendicular, and consists of a hard black stone, seemingly divided into strata by small horizontal fissures, placed at great distances from each other: the other sides of the cove are more open and rugged, the sea beats strongly into the creek, which at low water has a small sandy beach.

The curious memoir in the Transactions of the royal Academy of Sciences at Paris, for 1727 (1), communicated by the learned and indefatigable Monsieur de Reaumur, fully informs us of the art of making porcelain, and of the true substances used for that purpose by the Chinese; he has, in that memoir, judiciously considered China as a semi-vitrification, and on the principle of burning the
ware

ware to that exact state, he has established the perfection of the art; now, as all earths vitrify, it is evident no true porcelain can be made only of clays, but other necessary substances are required to hinder their perfect vitrification, and for such substances we can have recourse to the talcy class, the fossils of which class almost evade the force of fire, and, on that account, furnish us with the finest and best ingredients.

On this principle it is evident, that no species of clays whatever, can be finer or fitter for the making of porcelain, than these hardened talcy soap clays, wherein nature has blended the necessary fossils, talc and clay, ready for our use, I am therefore convinced, that these *Steatitæ* pounded, then moistened and worked up like a paste, with some proportion (if thought necessary) of fine soft clay, with due management, would make an elegant porcelain; I recommend the experiment for trials, to the manufactories lately established in this kingdom; and, should they succeed, I doubt not we shall be able to surpass the manufactures of the other European nations; since none, as I can learn, have these *Steatitæ* in such plenty as Cornwall affords us, nor so fine.

All the indurated talcy soap clays, as the *Steatitæ*, the *Morochtus*, the *Galaetites*, the *Melitites*, &c. succeed in a remarkable experiment, which is, that by writing with them on glass, they leave the letters, tho' invisibly fixed on it, yet not to be removed by washing, but always ready to appear; if the place be moistened by breathing on it.

(1) *Idée generale des differentes Manieres dont on peut faire la Porcelaine; et quelles sont les veritables Matieres de celle de la Chine, par Monsieur de Reaumur.* Hist. et Mem. de l' Acad. Roy. des Sciences pour 1727.

XV. *Steatites altera.*

Woodw. Cat. A. 20.

This *Steatites* is exceeding hard and heavy; it is unctuous and smooth, and chews soft and pure, or free from grittiness; it neither adheres to the tongue, nor melts in the mouth, and in water it is not at all diffusible.

Its colours are very various, but it is generally, and when purest, milk white, slightly spotted or specked with black bodies, like micæ, but are only a black *Steatites* substance; it has sometimes also large spots of the same; these spots are not superficial, but pervade the substance, and they are also sometimes rudely ramified like a *Dendrites*.

When less pure, it is frequently of a deep purple colour, sometimes with veins of white and black, and sometimes with thick veins of a stoney semipellucid whitish substance, exactly like tallow to appearance; this substance in reality is a pure talc, and sometimes an asbestine or fibrous texture is easily perceivable in it; and this substance is what I suppose induced Dr. Grew, Mus. Reg. Soc. p. 231. to judge the soap earth the matrix of the *Asbestos*.

It is also frequently found of a dull dusky green colour, with a cast of deep purple; the pieces of this sort are always variegated with numerous irregular veins of various thickneses, of the above mentioned tallow like substance, and in these peices it is the fibrous texture of the said talcy substance is most frequently very fair and perfect. The impurest kind is whitish, fouled,
and

and variously coloured, and in some places seems to be composed of the tallow like talcy substance, but it is always compact and solid, and so intimately blended with the substance of the *Steatites*, that it never forms any particular veins, neither does it ever exhibit a fibrous appearance.

Burnt, it acquires a stoney hardness, and a paler white colour, the tallow like talcy substance, burns to a light, very hard, and white body.

This kind is also found among the other soap clays, in veins and spots in the soap rock; it is chiefly in the veins and spots of this kind, that angular fragments of a hard, compact, weighty, and semi-transparent coarse spar, unctuous, and of deep purple and green colours, and somewhat resembling the red and green soap earths here described, but quite lapidified, are found, also the variegated Killas, and on this Killas it is the enameled incrustations, mentioned in the description of the old soap rock are found, the enamelled green incrustations, are entirely of the same nature, as the green enamelled incrustations or crusts of the Nephritic stone, or Jasper of the Hartz forest, hereafter to be described, and sometimes the Killas itself greatly resembles the said Nephritic Jasper.

XVI. *Steatites tertia.*

Morochtus, Schmeerstein Germ. Bruckm. Magn. Dei. in Loc. Subter. vol. I. p. 84. and 87.

Morettum album rectius Porcellana nativa. Bruckm. Epist. Itin. Cent. ii. Ep. 100. p. 1244. N°. 10. et seq.

This is a fine clay, of a pale white or pearl colour, of an elegant, smooth, and glossy surface, and quite unctuous and soft to the touch, of a compact, firm, and regular texture, very hard and exceeding heavy, but has not the least appearance of the talciness, common to the indurated soap earths, nor the least semi-transparency also observable in them, but is intirely an indurated opake pure fine clay.

It does not adhere to the tongue, or colour the hands; but drawn along a hard rough surface, leaves an unctuous, fine silvery white mark. It does not melt in the mouth, neither is it diffusible in water; but when broken between the teeth, is perfectly soft and pure.

This clay is commonly variegated with black and deep purple specks and spots, which are often rudely ramified like *Dendritæ*; they are not superficial but pervade the substance of the clay, and remain as perfect as ever after the earth has past the fire.

This kind is also found of a duller white and harder texture, and beautifully variegated with veins of a slight blueish black; the other varieties observed of it are, 1. with yellow spots; 2. greyish, or clouded dotted or streaked with grey; 3. with large brown spots, in which fine black *Dendritæ* shew themselves, this variety is rare; 4. brown, this variety is very rare; 5. marbled with white and ash colours with a greenish cast; and 6thly, with fine red *Dendritæ*.

This clay hardens extremely in the air, and sometimes fine pellucid angular crystals are found lodged in it.

In

In the fire it acquires a stoney hardness, and a pale brown colour.

It is dug in pits between Göpfersgrun and Thiersheim, a market town on the Tittersbach, and in the Fichtelberg, or Mons Pinifer in Franconia, between Eger and Wunsiedel, or Whonsiedel, a small town in the Margraviate of Bayreuth, and in most parts of the country thereabouts.

The inhabitants of the places where it is found, used formerly to work it into various utensils, as cups, mugs, boxes, &c. by which trade and their agriculture they entirely maintained themselves; both young and old were employed, some cutting and shaping it, while others hardened it in the fire, and others polished it, which they did in a very curious and elegant manner, and then sent them to Nuremberg, whence all Germany was supplied with it; but of late years their most ingenious and principal artists dying, they have near lost their art.

XVII. *Steatites indurata Melitites dicta.*

Lapis Melitites. Aldrov. Mus. Met. p. 668. Mus. Calceol. p. 276. Agricola de Nat. Foss. l. v. p. 606. Cæsalp. l. ii. c. 61. Imperat. Hist. Nat. l. xxv. c. 6. p. 593. Dale's Pharm. p. 23. N°. 9.

Argilla indurata albo-flavesceus lævis, quæ Melitites antiquorum. Hill's Hist. Foss. p. 24. N°. 14.

This is a pure fine indurated clay, without any appearance of talciness in its texture, of a pale dull ashen white, with a very faint cast, of a greenish yellowish, or reddish colours, and sometimes veins and spots of those colours variegate it; it is of a perfectly smooth, glossy, and unctuous surface, of a compact regular texture, very hard and heavy; it does not adhere to the tongue, does not colour the hands, but drawn along a board marks a fine white line; it is not diffusible in water, nor does it melt in the mouth, but when broken between the teeth, has a fine soft taste.

In the fire, it acquires a considerable hardness, and burns to a dark ash colour.

This is also found at Wunsiedel with the last described clay, and is wrought like that into cups, saucers, &c. it is also said to be found plentifully in Italy.

It derives its name, according to Dioscorides, from the Greek word μέλι, honey, from the sweet taste of the liquor it dissolves into, but what was called a sweet taste in this species, is in some degree common to all the indurated clays.

The ancients esteemed it a good external medicine in ulcers; they also attributed to it many imaginary virtues, when taken internally.

XVIII. *Argilla indurata Derbiensis.*

Crouch white clay in Derbyshire. Lister's table of clays. Phil. Trans. N°. 164. Lowthorp's Abridg. vol. ii. p. 451.

G

A hard

A hard stoney dry clay, of a pale ashen white colour, very heavy, of a compact regular texture, harsh, rough, without the least smoothness, and glittering with small micæ; it does not colour the hands, adheres not to the tongue, melts not in the mouth, but broken between the teeth, is extremely impure or gritty, and is slightly astringent, in water after some little time it diffuses, and leaves a prodigious quantity of sand at the bottom of the vessel.

In the fire it acquires a great hardness, and a clearer white colour.

The Critche clay pits hitherto dug, have been within the compass of half a mile, all in Critche parish, in Morlaston and Leet Church Hundreds, in Derbyshire, ten miles north of Derby.

The stratum of this clay runs from north to south, the breadth of it from east to west is imagined to be but narrow, one edge having bassetted out; the stratum has been found to lie very irregular, viz. from two yards to twenty yards deep, for where it bassetts out, the common soil and a reddish clay only lie over it, but where it dips the following strata occur, 1. the common corn soil about a foot, 2. a red tough clay about a yard, and in several pits loose masses of grit stone, lying flat wise, have been observed in this stratum, but chiefly where the clay is mixed with a reddish sand, 3. a shale; this stratum varies in thickness, according to the dipping of the stratum of clay, this shale is harder and formed into larger plates the deeper it lies; it is sometimes tinged with yellow, occasioned by the springs which pervade it, and also by the lands floods, which drench in it when the upper strata are spongy; globular nodules of iron stone are frequently found lodged in this shale. 4. Coal also varying in thickness, from one foot to three quarters of a yard, increasing in thickness as it dips. 5. A red kind of iron stone about six inches thick. 6. The roof or upper part of the stratum of clay; it is a heavy blackish stone, tho' of the same quality as the clay itself; this roof is about six inches thick, and the soil or bottom of the clay stratum is of this same substance; the clay itself is very irregular, having been found from one foot to three quarters of a yard in thickness.

This clay is used for making a brown ware at Critche; it is first ground down to a fine powder, and is then mixed in different proportions with the black Northampton clay already described, p. 30. N^o. 1. the proportions are $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{3}$, and $\frac{3}{4}$ of the Northampton clay to the Critche clay; the reason of this mixture is, that this is hard, stoney, and not tenacious enough to be worked alone; Dr. Lister also informs us, that the glass pots are made of it at Nottingham.

S E C T. II. M E M B. II.

Alcaline Clays.

XIX. *Cimolia alba sexta.*

A Fine clay, white, with a slight bluish cast, of a firm compact regular texture, not very smooth or unctuous, moderately heavy and hard, and colours the hands; it adheres strongly to the tongue, melts freely in the mouth, is pure or free from grittiness, and is readily diffusible in water.

It

It suffers very little change in the fire.

This is known by the name of Pool clay, and is used for making tobacco pipes; it is dug at a place called Hunger-hill, near Wareham in Dorsetshire, not many miles from Pool.

A stratum of this clay, of a paler or duller white, and somewhat gritty, is found next above the sand in the ochre pits on Shotover-hill, near Oxford.

XX. *Argilla alba octava, quibusdam Terra Sinensis.*

This clay is of a pale yellowish white colour, heavy and friable, of a regular and pretty compact texture, of a harsh surface, or without the least smoothness, and colours the hands very much; it adheres firmly to the tongue, melts readily in the mouth, has a fine taste, but is very impure, and in water it is immediately diffusible with a strong ebullition, and leaves a great deal of grit at the bottom of the vessel.

Pieces of this clay are also found so exceeding full of grit, as to be quite harsh and friable, and to appear like a Tripoli.

It crackles much in the fire, and bursts into powder, but suffers no change of colour.

This clay is found, tho' not in any quantity, in spots and small veins, among the *Steatitæ* in the new soap rock, at Gew Grez cove.

The earth of which the China ware is made, exhibited by Woodw. Cat. I. a. 6. as also the specimens of the China earth in Petiver's cabinet, which is added to the Sloanian collection, and of that magnificent museum, are this very species of clay.

XXI. *Argilla indurata alba Italica.*

A very hard compact pale whitish clay, not of a smooth surface, is light, adheres strongly to the tongue, melts difficultly in the mouth, is very soft to the taste, and quite pure and free from grittiness, and in water is difficultly diffusible.

In the fire it acquires an almost stoney hardness, and a slight reddish cast.

It is said to be dug in Italy.

XXII. *Steatites alba septima.*

This is a very unctuous soft white clay, and when moist cuts fat and greasy like butter, and is very viscid; when dry it is very friable and loose or not cohering, but appears like several lumps laid on each other, and not kneaded together; it does not colour the hands, adheres pretty firmly to the tongue, melts readily in the mouth is quite pure, and in water is readily diffusible.

In the fire it acquires a little hardness, and burns to a dull white, or very pale ashen colour.

This kind of *Steatites* is often found mixt with the other impurer kinds, as the coarse greenish and reddish soap clays in the new soap rock; it is also often found full of small pieces of a fine white, talcy, glittering, semi-pellucid spar, and sometimes plates of the said spar, from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch thick, of a slight striated texture, exactly like the *Septa* of some of the *Septariae* or *Ludibelmontii* kind, very remarkably pervade it.

XXIII. *Steatites alba octava.*

This is a fat unctuous variegated clay, and is made up of many lumps laid on each other, but not cohering together; it is greatly variegated with veins and spots of black, dull red, purple and yellow; it is easily broken between the fingers, without colouring them, melts readily in the mouth, is soft to the taste, and quite free from grittiness; it does not adhere to the tongue, diffuses immediately in water, and is very viscid.

This species of *Steatites* is also found very coarse and impure, it is then of a higher red colour, and has hardly any variegation of the other colours.

In the fire it acquires no greater hardness, but heightens its colours.

It is also found in veins and spots among the other kinds in the new soap rock.

XXIV. *Steatites alba nona seu Italica.*

This is an elegant and perfectly pure, fine, unctuous, soft, snow white clay, beautifully variegated or marbled with veins and spots of a pale black, it is of a very compact close firm texture, is very light, easily breaks between the fingers; does not colour the hands, adheres strongly to the tongue, melts slowly in the mouth, is quite soft, fat and pure; it diffuses slowly in water, and is very viscid, it is the finest soap clay I ever saw.

In the fire it acquires an almost stoney hardness, and burns to a fine bright white colour.

It is said to be dug in Italy.

XXV. *Steatites alba altera Italica.*

A fine clay of a white colour, with a slight reddish cast, and with spots and veins of a yellow ochreous substance; it is remarkably light, and breaks easily between the fingers, and is of a firm compact fine texture; it adheres firmly to the tongue, melts readily in the mouth, is extremely pure, fat, and soft to the taste; in water it raises a violent ebullition, is immediately diffusible in it, and is extremely viscid and tenacious.

In its remarkable lightness, and the fineness of its parts, it approaches much to the nature of those earths, called *Lac Lunæ* by authors.

Burnt, it acquires a considerable hardness, and a fine light blue colour.

This is also said to be dug in Italy.

XXVI. *Argilla rubro-alba.*

A hard weighty clay, of a reddish white colour, of a firm compact regular texture, of a harsh surface without the least smoothness, and colours the hands very much; it does not adhere to the tongue, it melts readily in the mouth, and is quite impure and gritty; in water it is readily diffusible, and leaves a great sediment at the bottom of the vessel.

Burnt, it acquires some little hardness, and a sullied white colour.

This clay lies dispersed here and there in nodules in the strata, above the gypsum, in the gypsum pits in Chellaston fields, four miles from Derby; a variety of this clay, of a yellowish white colour, and of a middling hardness, is also found in the said pits lying in small and short veins.

SECT. III. *The Ash and Grey Clays.*

MEMB. I.

Clays which are not acted upon by acids.

I. *Argilla cinerea.*

WOODW. Cat. A. a. 16.

This is of a very light ash colour, near white, of a compact, pure, and fine texture, very smooth, hard, and heavy; it does not colour the hands, melts difficultly in the mouth, and leaves no grittiness, adheres very slightly to the tongue, is not readily diffusible in water, and when moist is very viscid and tenacious.

Burnt, it acquires a stoney hardness, and a pale white colour.

It is dug in quantities at Cheame, near Epfom in Surry.

It abides the fire well for several days, and serves for the making the pots that are used for the incorporating of calamin with copper, in order to the marking of brass.

Kentm. Nom. Foss. p. 2. N°. 10. and p. 5. N°. 7. exhibits an *Argilla cinerea Herlesbergensis, ex qua Noribergæ cum terra arenosa fiunt vasa liquationis, in quibus Orichalcum conficitur*; and a *Terra cinerea Hispanica, ex qua vasa liquationis fiunt admixtis testis vasorum fractorum*, both which clays are probably of this species.

II. *Argilla cinerea Batavica.*

This is of a deep leaden ash colour, with a strong cast of green, heavy, hard, of a firm compact texture, of an unctuous smooth surface; it does not adhere to the tongue, melts freely in the mouth, and is somewhat gritty, is very readily diffusible in water, and while moist is exceeding tenacious and viscid.

In the fire it acquires a stoney hardness, and a dull cinamon colour.

It

It is dug at Osterhout near Breda, and, as I am informed, is one of the clays used for the making of the Delft ware in Holland.

III. *Argilla pallide cinerea friabilis.*

An exceeding fine, soft, smooth but not unctuous clay, of a pale whitish ash colour, moderately heavy, very easily broken between the fingers, and colours the hands very much; it adheres to the tongue, melts readily in the mouth, is very fat and soft to the taste, and extremely pure, is readily diffusible in water, with a strong ebullition, and is very tenacious when moist.

Burnt, it acquires a very pale red colour.

This clay forms a stratum in the high cliff, which hangs over the river Elwy, on the right hand side of the road, between Llanerch and St. Asaph in Flintshire.

IV. *Argilla cinerea quarta.*

This is a clay of a dark ash colour, with a slight vinous cast, moderately hard and heavy, of a fine texture, of a very unctuous surface, and slightly colours the hands; it melts freely in the mouth, is quite soft and greasy to the taste, and leaves a little grittiness; it adheres slightly to the tongue, is readily diffusible in water, and is very viscid and tenacious when moist.

Burnt, it acquires a great hardness, and a white colour.

This clay is dug in several parts of this kingdom; and I have also received it from Clavelles in Normandy.

V. *Argilla cinerea quinta.*

A dark ash coloured clay, moderately soft and smooth, of a loose texture and light, it slightly colours the hands, adheres to the tongue, melts readily in the mouth, is impure, and leaves some grittiness, and is readily diffusible in water.

In the fire it acquires no additional hardness, and burns to a fine flesh colour.

A stratum of this clay, above nine yards thick, is found on Bulkeley Mountain in Flintshire; it is dug in hard lumps resembling a shaley rock, and is left exposed to the air for two or three years, to soften, it is then beaten down and sold to the lead smelting mills, for half a crown *per* ton, for it endures the fire so exceeding well, that all the bricks in the fire furnaces are made of it, and it is also used instead of mortar to fasten them; it is sent to Ireland and Scotland for the same purpose.

VI. *Argilla indurata cinerea, Galaetites dicta.*

Galaetites. Plin. Hist. Nat. l. xxxvii. c. 10. Matth. p. 1385. Gefner de fig. Lap. p. 150. Kentm. Nom. Foss. p. 26. N°. 4. Cæsalp. l. ii. c. 61. Imperat. Hist. Nat. l. xxv. c. 6. p. 593. Aldrov. Mus. Met. p. 665. Calceol. Mus. p. 276. Dale's Pharm. p. 23. N°. 8. Bruckm. Epist. Itin. Cent. ii. Ep. 100. p. 1243.

Argilla indurata cinerea lævis, quæ Galaetites antiquorum. Hill's hist. Foss. p. 23. N°. 13.

This is an indurated clay, but less hard and glossy than the *Morochtus*, *Melittites*, &c. of a pale grey or ash colour, of a compact, close, and even texture, and very heavy; it does not adhere to the tongue, colours the hands a little, and on account of its hardness, is not diffusible in water; neither does it melt in the mouth, but when broken between the teeth, has a smooth fine luscious taste, and is quite pure; if rubbed down with water on marble, it dissolves into a substance of a pure white resembling milk, from which properly it derives its name.

Varieties of it of other colours are also found, as white, reddish, inclining to purple, yellowish, and Kentm. l. c. N°. 3. as also Cæsalpin, mention a black *Galaetites*; it is also sometimes found spotted.

In the fire it burns to a pure white, and acquires a great additional hardness.

The ancients found it in the Nile, and some of the rivers of Greece; at present it is dug in many parts of Germany, and in Italy; most of the authors, copying each other, say, it is particularly found in large masses in the bishoprick of Hildesheim, but a later author, viz. Bruckman, l. c. says, tho' he searched carefully for it, he could never meet with it in that territory.

The ancients used it, and, as Dioscorides assures us, with success, for fluxes and ulcers of the eyes, and Galen commends it as an astringent; at present we know none of those virtues of it, but in some places in Germany, they cut it and turn it into several utensils; it acquires so great a hardness in the fire, as to be very fit for that purpose.

SECT. III. MEMB. II.

Alcaline Clays.

VII. *Argilla viridi-cinerea.*

POTTERS earth. Wood. Cat. g. a. 3.

An Argilla cinerea ponderosa. Hill's hist. Foss. p. 20. N°. 7?

This is of a pale ash colour, with a strong cast of olive green, of a very hard, compact, and firm texture, of a rough harsh surface, but scrapes smooth, and somewhat unctuous; it is moderately heavy, does not colour the hands, adheres slightly to the tongue, melts slowly in the mouth, and leaves some grittiness;

grittiness; it is readily diffusible in water, and when moist is moderately tenacious.

It effervesces violently with aqua fortis.

In the fire it acquires a stoney hardness, and a pale red colour.

It is dug in great quantities on the east banks of the river Medway, betwixt Maidstone and Rochester, in Kent.

It is used at Vauxhall for making the common white pots.

VIII. *Argilla cœrulea-cinerea.*

A clay of a light blueish ashen colour, with sometimes veins and spots of a greyish clay intermixed with it, of a harsh loose texture, and without any smoothness; it does not adhere to the tongue, melts readily in the mouth, and is extremely impure and gritty; it is readily diffusible in water, and leaves a great deal of grit at the bottom of the vessel; when moist it is very viscid and tenacious.

In the fire it acquires a great hardness, and a very pale brown colour, with a cast of red.

It is dug in great quantities in several places near Lough Neagh in Ireland, and quantities of fibrous talcs and *Selenitæ* are found lodged in it.

It is imported to Liverpool in great quantities, and is there used for making of potters ware, for which purpose it is an excellent clay; it is sold for five shillings *per* ton at the pits.

This species of clay, but much finer and purer, slightly smooth, and of a pale whitish ashen colour, is also dug near Northwich in Cheshire, and is likewise carried to Liverpool, where it is used in the earthen ware manufactory.

I have also found this clay, but extremely impure and vitriolic, in a shaft (then sinking for lead) at Matlock in Derbyshire, where it lay intermixed with the *Argilla cœruleo alba*, already described p. 35. N^o. 10.

S E C T. IV. *The red Clays.*

M E M B. I.

Clays which are not acted upon by acids.

I. *Argilla pallide rubescens.*

ARGILLA *mollis pallide rubescens.* Hill's hist. Foss. p. 33. N^o. 1.

This is a fine clay generally of a pale red colour, sometimes paler, at other times of a very high colour, greatly veined and variegated with a greenish ashen clay, of a firm and compact texture, moderately hard and heavy, of a smooth surface, but neither glossy nor unctuous; it does not colour the hands, adheres very slightly to the tongue, melts freely in the mouth, is astringent to the taste, and is slightly gritty; in water it is readily diffusible, and when moist is very tenacious.

Burnt,

Burnt, it acquires a great hardness, but suffers little change of colour.

It is found in the isle of Wight; there is a vein of it, tho' not large, runs through the island from east to west; this vein may be particularly traced about three miles to the westward of Newport, at a place called Apesdown, on each side of the road, and about three miles further on the same road, it is found at a village called Colborne, on the left hand side, opposite to the church; but it is seldom to be found pure, being mixed with the sandy soil.

Hill mentions, that a large stratum of it is found in the hill near the surface, over the great loam pits at Hedgerly in Buckinghamshire, but I could find no such earth when I visited the said place.

I found this same species of clay not unctuous or hard, but harsh, and near dry, friable, of a higher red colour, and somewhat vitriolic, in veins on the bank sides of Swanwich Common, and Swanwich Delves, near Alfreton in Derbyshire.

The reddish earth from New England, exhibited by Woodw. Cat. L. a. 1. is this species of clay, but very coarse.

It is said that for some years past, much of it has been brought to London, for the use of the workers in mahogany, to heighten the redness of that wood when new wrought, and also to imitate it with deal, &c. by colouring it with this earth.

The first discovery of this earth was made about the year 1729, and it was first mentioned in an octavo pamphlet, intitled, *The art of drawing and painting in water colours*, printed in 1731, in which, p. 39. is the following, I have lately seen an earth brought from the isle of Wight, of a much finer colour than the Indian red; which I and some others have tried, and find to mix extremely well with gum water; though, as it is of a viscous nature, it requires less gum, than most other colours; and as it is naturally fit for use without grinding, and is viscous, so it will assuredly mix as well with oil as with water. There is one thing very extraordinary in this earth, simple as it is, that if we rub a deal board with it, it renders it exactly of the colour of mahogany wood, and stains it so deep, and with so much strength, that it is very hard to get it out with washing, and dry as this earth was when I received it, I cannot get it out of some papers, which by accident were mixed in my pocket with it; so that I am persuaded it will be of extraordinary use, when its virtues come to be known.

II. *Argilla rubra.*

A compact firm stiff clay, of a coarse texture, of a deep dull red colour, with spots of an orange coloured clay intermixed, of a smooth unctuous surface, and soft to the touch; it does not colour the hands, but marks very freely on paper; it is weighty and pretty hard, adheres but slightly to the tongue, melts slowly in the mouth, is slightly astringent to the taste, and somewhat gritty; in water it is readily diffusible, and when moist is tenacious and viscid.

In the fire it acquires a great hardness, with no change of colour.

It is chiefly found in iron mines.

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This clay answers in many particulars, to the *Argilla lævis e fusco sordide rubescens*, of Hill's hist. Foss. p. 33. N°. 3. but as that author asserts his described clay to raise a considerable effervescence with aqua fortis, it cannot be the same.

III. *Argilla saturate rubra unctuosissima.*

Rubrica molliuscula, softer ruddle. Woodw. Meth. of Foss. p. 2. N°. 6.

Rubrica fabrilis mollis. Kentm. Nom. Foss. p. 8. N°. 1. Bruckm. Epist. Itin. Cent. iii. Ep. 3. p. 19. Mercat. Met. Vat. p. 23.

Rubrica fabrilis. Merret. Pin. Rer. Nat. Brit. p. 218. Charlt. de Foss. p. 219. N°. 3.

The soft or clayey iron ore. Woodw. Cat. A. 95. 95* et 96.

Marga ponderosa rubra mollis, quæ rubrica fabrilis authorum. Hill's hist. Foss. p. 47. N°. 5.

This is a clay of a dusky red colour, rather of a loose than of a compact texture, ponderous, very friable, excessive unctuous, and with an oily glossy appearance, and colours the hands strongly with the same glossy unctuousity; it adheres to the tongue, melts pretty readily in the mouth, is harsh and somewhat gritty; in water it is readily diffusible, with a great ebullition, and leaves a large quantity of grit at the bottom of the vessel.

This clay in reality is a soft or clayey iron ore, and some of it contains as much iron as to render it worth smelting.

Burnt, it acquires a very great hardness, and its surface suffers little change, but interiorly it resembles a piece of iron.

It is found chiefly in iron mines, in several parts of Europe; that from Saxony and the Hartz, I have observed to contain radii, and pieces of a fine rich and curious *hæmatites*; we have this clay in many parts of this kingdom, as in Cumberland, in the iron mines of Langron, which is the finest; in Cheshire, in Yorkshire, and in Caernarvonshire, in Wales: I have also observed it, if I mistake not, in some of the tin loads in Cornwall, where they call it a red feeder.

The inhabitants of the north of England work it up into small balls, and use it for the smitting, as they call it, or marking the sheep, from whence by them it is called smit, but the miners of those parts call it the mother of the mine.

It is used by painters, and makes a red little inferior to the Indian red earth.

Kentm. p. 3. N°. 28 et 29. exhibits two kinds of earths, which he synonyms *Terra rubea friabilis ex ærifodinis Islebiæ, et Terra Rubea mollis scissilis Vualdenburgica, venæ minii non dissimilis*; and Bruckm. Cent. ii. Ep. 45. p. 498. N°. 186. exhibits among the mineral earths, a red glossy mineral, which, says he, is dug at Ilfenburg, near the Mountain Bruçterus or Blockberg, and being soft and tenacious like a clay, it is made up into balls, with which the potters paint their furnaces of a fine glossy irony colour; these three exhibited earths are probably referable to this species of clay.

SECT. IV. MEMB. II.

*Alcaline Clays.*IV. *Argilla rubra altera.*

THIS is a clay of a high red colour, with a strong cast of an orange colour, very hard and heavy, and of a slightly smooth surface; it does not colour the hands, adheres slightly to the tongue, melts readily in the mouth, is astringent to the taste and very impure; in water it is readily diffusible, and leaves a great sediment of a sand, of the same colour, at the bottom of the vessel; when moist it is exceeding tenacious.

In the fire it acquires little hardness, and burns to a deeper colour.

This clay and the sand of the same colour, which are found intimately mixed together, constitute the soil of the place called Red Hill, from the colour of these substances, situated about a mile from Reygate in Surry.

This same species of clay, but harsher and of a paler colour, is also found in some places in the Canton of Bern in Switzerland.

V. *Argilla Cinereo-rubra.*

A fine clay, of a pale ashen red colour, of a very hard, firm, compact, regular texture, slightly smooth and light; it does not colour the hands, adheres firmly to the tongue, melts pretty freely in the mouth, has an unpleasant astringent taste, and is very impure; in water it is slowly diffusible, and leaves a great deal of grittiness.

In the fire, it acquires some hardness, and burns to a blackish blue colour.

It is dug in several places in Spain, but chiefly near the city of Toledo, for which reason its most usual name is the Toledan earth.

It is in great esteem and use in that kingdom, to purify their wines, and as a fullers earth; they also makes pots of this earth, mixed with other clays, to preserve the water in.

SECT. IV. MEMB. III.

*Clays imperfectly described in regard to the effects acids have on them.*VI. *Argilla rubra tertia.*

EARTH native, and as taken up in Lancashire, and the same depurated. Woodw. Cat. G. a. 1 et 2.

This is a very beautiful unctuous clay, of a fine red or cinnabarine colour, veined with white, and not very impure; the depurated piece is quite red, and perfectly fine and pure.

VII. *Argilla rubra quarta.*

Generally of a fine red colour, but sometimes pale and spotted with a white clay, friable, very dry or harsh, and without any smoothness, it colours the hands, adheres pretty firmly to the tongue, melts freely in the mouth, is slightly astringent to the taste, and very impure; in water it is readily diffusible, and when moist is moderately tenacious.

I have also seen pieces of this clay quite porous, and pervaded with ferruginous veins.

It is dug in the province of Jersey, near Pensylvania in America.

VIII. *Argilla purpurea.*

This is a moderately compact firm clay, smooth, and somewhat unctuous, of a dusky purplish colour, or exactly like that of the dregs of red wine; it is moderately hard, does not colour the hands, adheres slightly to the tongue, melts freely in the mouth, is somewhat astringent to the taste, and is very impure; in water it is readily diffusible, and when moist is very viscid and tenacious.

It is dug at Dentschbeuren in Switzerland.

S E C T. V. *The yellow Clays.*

M E M B. I.

Clays which are not acted upon by acids.

I. *Argilla lutea improprie ochra dicta.*

YELLOW ochre and French ochre. Woodw. Cat. A. a. 75. et Cat. I. a. 30.

Ochra argillacea sordide flavescens. Hill's hist. Foss. p. 55. N^o. 9.

This, tho' universally called an ochre, is a genuine clay; of a fine dusky yellow colour, of a compact firm texture, moderately heavy and hard, and of an unctuous smooth surface; it slightly colours the hands, adheres slightly to the tongue, melts readily in the mouth, is soft, and leaves but little grittiness; in water it is readily diffusible, and when moist, it is very viscid and tenacious.

That sort of ochre which is commonly called French ochre, is of this kind of clay, but is finer and not so argillaceous; there are also many gradations of higher, brighter, duller or paler yellow, in the varieties of this species of clay.

In the fire it acquires a great hardness, and a fine bright red colour.

It is of great use in painting, and is sold in the colour shops of this metropolis by the names of French ochre, and spruce ochre, and when ground down by that of powder ochre.

It is dug in many places in this kingdom; and, as I am informed, in some parts of Flanders.

It is particularly dug on Shotover Hill, near Oxford; it there constitutes a stratum, says Dr. Woodward, of three or four inches thick, about 10 feet deep. Over it lies a stratum of fine pale white sand, in which numerous ferruginous Geodes's are imbedded, and over this sand lies a white clay. It is also sometimes found in the lead mines of Flintshire and Derbyshire.

This species of clay differs in very few particulars, as has been before observed, from the *Terra sigillata Strigoniensis flava*, described p. 23. N°. 3.

II. *Argilla pallide flavescens.*

Argilla impurior friabilis pallide flavescens. Hill's hist. Foss. p. 26. N°. 3.

This is a rough, irregular, impure, coarse clay, of a pale brownish yellow colour, ponderous and hard, of a somewhat loose texture, and friable; it is not in the least smooth, does not colour the hands, adheres to the tongue, melts readily in the mouth, is very astringent to the taste, but is excessive impure; in water it is readily diffusible, and leaves a great deal of grittiness at the bottom of the vessel.

It burns to a great hardness, and a pale red colour.

It is dug in many parts of this kingdom; it is used in the making of the Staffordshire and Northamptonshire coarse earthen ware, and, as I am informed, it is also one of the clays made use of in the Delft manufactory.

III. *Argilla coloris pallide Straminei.*

This is of a loose texture, rough or without any smoothness, light and friable, it is of a pale straw colour, it slightly colours the hands, does not adhere to the tongue, melts readily in the mouth, and is very impure; in water it diffuses somewhat slowly.

Burnt, it acquires a fine red colour, and becomes quite friable.

It is found in Dover Cliffs in Kent.

SECT. V. MEMB. II.

Alcaline Clays.

IV. *Argilla fusco-lutea.*

OCHRA *Argillacea luteo-fusca levis.* Hill's hist. Foss. p. 55. N°. 10.

This, tho' an impure clay, is of a fine texture, of a dusky brownish yellow colour, very light, and of a slightly smooth surface; it is friable, slightly colours the hands, adheres firmly to the tongue, melts freely in the mouth, and leaves a great deal of grittiness. In water it raises a great ebullition,

lition, but is not readily diffusible, and when moist, is exceeding viscid and tenacious.

Burnt, it acquires a great hardness, and a fine red colour.

I have never yet observed this clay in a regular stratum, but have hitherto only found it in irregular lumps, chiefly in great plenty in the clay pits near Blackheath and Deptford; I have also found many ferruginous Geodes's near the great sand pit at Woolwich filled with this clay.

It is not as yet used in painting, tho' I am persuaded it will prove a valuable colour, having a good body, and being of an agreeable, tho' dusky yellow.

V. *Argilla fusco-lutea altera.*

Argilla impurior friabilis luteo fusca. Hill's hist. Foss. p. 26. N°. 4.

This is an impure clay, being frequently intermixed with fragments of pebbles, sand, &c. it is of a very pale brownish yellow colour, variegated with veins of a greyish clay, heavy, compact, and but of a slight smooth surface, tho' it cuts even with the spade; it adheres slightly to the tongue, melts freely in the mouth, is readily diffusible in water, and leaves a great deal of grittiness at the bottom of the vessel, and when moist is moderately tenacious.

In the fire it acquires a considerable hardness, and a dusky red colour.

It is dug in most parts of this kingdom. Near Northampton it lies but few spades deep; they use it there for making of pan-tiles, bridge-tiles, clinkerts, or paving bricks, &c. and reckon it by much the easiest clay for working.

VI. *Argilla flava ponderosa tenax.*

Hill's hist. Foss. p. 25. N°. 1.

This is a clay of a brownish yellow colour, heavy and hard, of a firm and regular texture, of a smooth surface; it slightly adheres to the tongue, does not colour the hands, melts but slowly in the mouth, leaves a little grittiness, and in water is slowly diffusible.

Burnt, it acquires a red colour, but no additional hardness.

It is dug in several parts of this kingdom; and it generally lies near the surface; that dug about Islington is principally used by the brewers; but in Staffordshire and Northamptonshire, they make an ordinary sort of earthen ware of it.

VII. *Argilla pallide flavescens tenax.*

Argilla pallide flavescens ponderosa tenax, caeruleo variegata. Hill's hist. Foss. p. 25. N°. 2.

This is a clay of a pale yellow colour, variegated with blue, heavy and hard, of a compact regular texture, and of a smooth surface; it adheres firmly to the tongue, does not colour the hands, melts freely in the mouth, and is very pure, in water it is freely diffusible.

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In the fire, it acquires a great hardness, and a fine red colour.

It is dug in several parts of this kingdom; chiefly in Staffordshire and Northamptonshire; in the former county they mix it with other clays for the making of pots, in the latter county they work it alone in their fine ware.

SECT. VI. *The brown Clays.*

MEMB. I.

Clays which are not acted upon by acids.

I. *Argilla obscure fusca.*

A Clay of a very deep brown or near a coffee colour, very heavy and hard, of a strong, firm, but not close texture, of a smooth glossy surface; it does not colour the hands, adheres firmly to the tongue, melts freely in the mouth, is very astringent to the taste, and is quite pure or free from grittiness; it is readily diffusible in water, and when moist, is exceeding viscid and tenacious.

What is very remarkable in this earth, and distinguishes it from all others I am yet acquainted with, is the alteration it sustains in the fire, for it burns to a great hardness, and a bright glossy red colour, and the pieces become full of cracks, which quite pervade them, their surfaces are also beset with botryoid tubercles which appear crustated, so that in the whole it exactly appears like a piece of *hæmatites*.

This clay was found in a fissure in a chalk pit, near Norwich in Norfolk.

It has not yet been put to any use, but I am persuaded it will prove a valuable colour, having a good body; and as it is of a viscous nature it will require less gum, and will mix as well with oil as with water.

II. *Argilla livide fusca-tenax.*

Hill's hist. Foss. p. 27. N°. 3.

This is a clay of a dusky or blackish brown colour, very weighty and hard, of a stiff compact texture, and of a smooth surface, it does not colour the hands, adheres to the tongue, melts difficultly in the mouth, has an astringent and frequently a vitriolic taste, occasioned by the great quantities of irony vitriolic *pyritæ* found in the strata of this clay; in water it is slowly diffusible, and leaves some grittiness.

It burns to a red colour, with some additional hardness.

It is dug in most of the counties of England, and is generally used for the making of tiles.

III. *Argilla ponderosa viridi-fusca rubro variegata.*

This is a very elegant pure clay, of a dusky brown colour, with a very strong cast of a dark green, and is beautifully marbled with veins and spots of a fine red clay, which red clay, when fresh dug, stains a very fine colour; it is very heavy and hard, of a dense compact regular texture, of a fine smooth unctuous and glossy surface; it does not colour the hands, adheres firmly to the tongue, melts freely in the mouth, is very soft and smooth to the taste; in water it is slowly diffusible, leaves no grittiness, and when moist, is viscid and tenacious to a great degree.

Burnt, it acquires a great hardness, and a pale red colour.

This clay is dug at Wakefield Lodge, near Potters Perry in Whittlewood Forest in Northamptonshire. It lies very near the surface.

IV. *Argilla indurata pictoria fusca.*

This is a fine indurated clay, of a deep brown or coffee colour, of a compact uniform regular texture, very light and extremely shattery, especially when wetted; it breaks very smooth and glossy, tho' exteriorly it is hardly smooth; it does not colour the hands, it adheres remarkably firm to the tongue, does not melt in the mouth, but when broke between the teeth, is very soft and pure; in water it immediately shatters into pieces, with a very strong ebullition, but is not at all diffusible in it.

When this clay is wetted it marks a fine yellow on paper; it is used in painting, and is sometimes to be met with in the colour shops of this metropolis, by the name of *Terra di Sienna*.

Burnt, it acquires no hardness, and changes to a pale reddish brown.

A coarser kind of this earth, of a paler brown colour, not so glossy, and which does not mark so good a yellow, is found at a place called Baldwyn's Dale, near Wycombe in Buckinghamshire.

S E C T. VI. M E M B. II.

*Alcaline Clays.*V. *Argilla lateritia.*

THE varieties of this clay are of different colours, as dusky reddish brown, dusky blackish brown, light yellowish brown, phillemot colour, &c. it is very compact, heavy, of a tough viscid texture, and, while in the stratum, easily cuts through with the spade, and has a smooth glossy surface; when dry, it is hard, of a paler colour, and also smooth, it does not colour the hands, some varieties of it adhere pretty firmly, others but slightly to the tongue, they melt generally freely in the mouth, are soft to the taste, but are

are not quite free from grittiness; and some varieties are difficultly, others are readily, diffusible in water.

They all burn red with some additional hardness.

These clays are dug in most parts of the world, and in most counties of this kingdom; especially in Kent, Surry, and Middlesex, and are universally used to make bricks and tiles.

The clays for making bricks and tiles, are always dug up about nine months, and are exposed to the air before they are fit for use, by reason that the pyrites being found in very great quantities in them, especially those of Surry, Kent, and Middlesex, the said clays are ever full of the vitriolic salts of that mineral, which they drain or clear from them, (that the bricks and tiles may be more firm and durable) by exposing them to the rain and weather; otherwise if the salts were not drawn forth before the clay was baked, they do not only hinder its setting well in the kiln, but are apt to liquefy afterwards, and so make the bricks and tiles moulder and decay; Dr. Woodward even says, that he thinks the space of time the clay is to lie exposed before it be worked, is ascertained by act of parliament.

The clays are found from three to fourteen or fifteen feet deep, and constitute strata of great thickness; *Selenitæ* are found in these clays, and strata composed of masses (laid like pavements) of *septariæ* or *ludus belmontii* abound in them.

There are several varieties of the clays used for making bricks and tiles, their chief differences consist in their being of a paler or darker colour, or of a greater or less purity, which are far from being characteristics sufficient to make them of different species.

The disposition of the strata of clay, in the principal places where it is dug about London is as follows:

About the Pinner of Wakefield, Lamb's Conduit Fields, &c. 1. a loam till about ten feet deep; 2. the common or brick clay, called by the diggers yellow clay, till about thirty two feet deep. Under this lies a black clay, which being useless, they never dig through, but it has been found to continue till fifty feet depth, and grows blacker the deeper it lies.

Great quantities of the *stalagmoides coralliformis ramosus*, *septariæ* or *ludus belmontii*, and *pyritæ* are found in these pits, and fine *entrocho-asteriæ*, *crustaceæ*, and *belemnitæ*, are pretty frequently met with.

The strata of clay lie nearly level, or without any observable dip.

The strata in the clay pits behind Shoreditch church are, 1. rubbish or an extraneous surface through which they dig six feet; 2. a reddish and a greyish brick clays, the former four inches, the latter two inches thick; 3. a common clay two foot eight inches thick; 4. a sandy loam and a gravel, in which the springs are, two feet each; 5. a reddish brown clay, called red clay by the diggers, one foot, and then the best sort of brick clay, which holds about nineteen feet thick; under this clay lies a sandy loam with burs, which is an earthy dusky bleuish substance, spangled with small micæ; but as it is useless, they never dig through it; it has been observed to continue twenty feet deeper.

Septariæ or *ludus belmontii* and *pyritæ*, are found in great quantities,
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and vitriolized wood, amber, a sort of false jet, small shells, chiefly turbinated, *glossopetræ* and *crustacea*, are not uncommonly met with in these pits.

The disposition of the strata in the clay pits of Surry, differs very little from that of the Middlesex clay pits.

VI. *Argilla pallide fusca.*

Argilla dura pallide fusca. Hill's hist. Foss. p. 27. N° 4.

This is of a pale brown colour, very hard, moderately heavy, of a firm compact texture, and spangled with small micæ; it is of a rough surface, does not colour the hands, adheres firmly to the tongue, melts slowly in the mouth, is difficultly diffusible in water, and leaves a great deal of grittiness.

Burnt, it acquires a great hardness, and a purplish red colour.

It is dug almost all over the kingdom.

SECT. VII. *The blue Clays.*

M E M B. I.

Clays which are not acted upon by acids.

I. *Argilla pallide cœrulea.*

A Fine clay of a pale greenish blue colour, very hard and heavy, of a firm compact regular texture, of a smooth surface, but not unctuous or glossy; it does not colour the hands, adheres slightly to the tongue, melts slowly in the mouth, is harsh and astringent to the taste, is quite pure or free from grittiness; in water it immediately divides into plates, and is freely diffusible.

In the fire it also separates into plates, acquires a great hardness, and a light brown colour.

It is said to be dug in the Province of Gothland in Sweden.

II. *Argilla violacea.*

This is a very fine pure clay, of a very pale violet colour, very unctuous and smooth, of a firm compact texture, heavy and moderately hard; it does not colour the hands, adheres firmly to the tongue, melts readily in the mouth, is impure or gritty, is very diffusible in water, and, when moist, is tenacious and viscid.

Burnt, it suffers little change of colour, and acquires a great hardness.

It is said to be dug in Franconia.

Kentm. Nom. Foss. p. 2. N° 18. exhibits a *Terra saponaria, violacea, elboghiana*, et N° 17. he also exhibits a *Terra violacea friabilis, Juliensis*, which clays are perhaps of this very species.

III. *Argilla cœrulea tertia.*

This is a fine clay, of a light lead colour, of a firm compact texture, heavy, hard, and of a smooth unctuous surface; it does not colour the hands, adheres firmly to the tongue, melts readily in the mouth, and is very pure or free from grittiness; in water it is readily diffusible, and, when moist, is very viscid and tenacious.

Burnt, it acquires a considerable hardness, with little change of colour.

It is dug about Paris.

SECT. VII. MEMB. II.

*Alcaline Clays.*IV. *Argilla cœrulea quarta.*

ARGILLA *subcœrulea friabilis mollior.* Hill's hist. Foss. p. 28. N^o. 1. This is a clay of a pale ashen blue colour, light, friable, of a loose or not firm texture, and has no smoothness; it does not colour the hands, adheres firmly to the tongue, melts readily in the mouth, and leaves some grit, and in water is not readily diffusible.

It requires a little hardness in the fire, and burns to a reddish ashen colour.

It is dug in several places of this kingdom.

V. *Argilla cœrulea quinta.*

A very coarse impure harsh clay, without any smoothness, of a deep lead colour, heavy, hard, and of a loose texture; it slightly colours the hands, does not adhere to the tongue, melts freely in the mouth, is astringent to the taste, and extremely impure; in water it is pretty readily diffusible, with a slight ebullition, leaves a great deal of grittiness at the bottom of the vessel, and, when moist, is very tenacious and viscid.

It ferments violently with aqua fortis.

Burnt, it acquires a considerable hardness, and a pale white colour.

This earth was found, about twenty feet deep, in the lime-stone quarry near Bath.

SECT. VIII. *The green Clays.*

MEMB. I.

*Clays which are not acted upon by acids.*I. *Argilla indurata cœruleo-virescens Terre verte vulgo dicta.*

WOODW. Cat. I. a. 32. et 33.

Argilla indurata cœruleo-virescens lavis, quæ Terre verte vulgo in officinis. Hill's hist. Foss. p. 31. N°. 3.

This is a fine pure indurated clay, of a very beautiful deep blueish green colour, very heavy and hard, of a dense firm regular texture, and of a smooth and glossy surface; it does not colour the hands, but when drawn along a rough surface, marks a greenish line; it adheres firmly to the tongue, melts difficultly in the mouth, and has a disagreeable coppery taste; in water it is very slowly diffusible, is viscid and somewhat tenacious when moist; and is quite pure and free from grit.

Hill says, that it seems like the *morochtus* and *steatites*, something to approach to the nature of talcs, in which he errs, since this substance is entirely of a clayey constitution, and has not the least admixture of talc in it.

This earth is generally found in loose masses of different sizes, imbedded in other strata; it is brought us from Italy, and is found, says Woodward, in considerable quantities in a mountain not far from Rome.

Burnt, it acquires a great hardness, and a dusky brown colour.

When scraped and the finer parts separated, it is ready to be made up with oil for the painters, and makes the most true and lasting green of any simple body they use.

The green loam found at Woolwich, seems to owe its colour to this earth, for after repeated washings it becomes clear, and the green colour being collected and burnt, suffers the same changes in the fire as this *Terre verte*.

The *Argilla virescens ponderosa tenax*, of Hill's hist. Foss. p. 30. N°. 1. is only a variety of this kind; and the earths exhibited by Kentm. Nom. Foss. p. 2. N°. 20. *Terra viridis saponaria in Thuringia propè Beichlingum eruta*, by Grew Mus. Reg. Soc. p. 349. a green earth like that which Kentman calls *Saponaria*, and by Gronov. Ind. Sup. Lap. p. 105. N°. 3. *Argilla saponacea viridis*, from Jersey in America, are probably all referable to this species of earth.

II. *Argilla indurata virescens Morochtos dicta.*

Morochtos, meroetes, galaxia, leucographis, leucogæa. Diosc. et Plin. hist. Nat. l. xxxvii. c. 10. Gesner. de fig. Lap. p. 150. Kentm. Nom. Foss. p. 25. et 26. N°. 1. et 2. Aldrov. Mus. Met. p. 668. Boet. de Lap. p. 411. De Laet. de Gem. p. 140. Worm. Mus. p. 71. Imperat. Hist. Nat. l. xxv. c. 6. p. 593. Mus. Calceol. p. 275. Charlt. de Foss. p. 264. N°. 14. Ray's Travels, p. 226. Dale's Pharm. p. 23. N°. 7.

French chalk, French marking stone, or Craie de Briançon. Woodw. Method of Foss. p. 3. N°. 7. et Cat. I. a. 46. et 47.

Creta Hispanica subviridis, talco similis. Mus. Richt. p. 142.

Argilla indurata albo-virescens levis, quæ Morochtus antiquorum. Hill's hist. Foss. p. 22. N°. 12.

Talcum solidum semipellucidum pictorium, creta Briançonia, creta Hispanica, creta sartoria. Wallerii Mineralog. Species 134.

Talcum particulis acerosis sparsis friabilibus subdiaphanis inquinantibus. Creta sartoria. Linnæi Syst. Nat. p. 157. N°. 8.

This is an indurated clay of a greenish colour, semi-transparent, very hard and heavy, of a compact regular texture, and of a smooth, unctuous, and glossy surface; it does not colour the hands, scrapes white, and, when drawn over a rough surface, marks an unctuous silvery line; it does not adhere to the tongue, does not melt in the mouth, but when broken between the teeth, is very soft, pure, and of a slight astringent taste; in water it is not at all diffusible, on account of its hardness.

Varieties of it of other colours, as whitish, almost black, with a brown cast, and yellowish, are sometimes, tho' rarely, found.

It burns to a great hardness and a white colour.

It is generally found in loose masses of different sizes.

It is at present found in great quantities at Cézanne and Seltriches, places near the city of Briançon, in Dauphiny in France, from whence it has obtained its English and French names, of French or Briançon chalk, or French marking stone; it is also found in great quantities in many parts of Italy, as in the territories of Placentia, and in the dukedom of Tuscany, especially at Monte Nero near Leghorn, in the kingdom of Sardinia, in the Apennine hills, in many parts of Germany, and, according to Wormius, also in the island of Fero, on the banks of a river where it incrusts the rocks like tartar; the ancients, according to Dioscorides, had it principally from Egypt.

The present use this indurated earth is put to, is only to mark cloth for the tailors; but the ancients held it in esteem in medicine, as an astringent, and commend it in hæmorrhages, disorders of the bladder, and for stopping defluxions of matter on the eyes.

III. *Argilla indurata viridis Lapis thyites dicta.*

Lapis thyites. Offic. Matth. p. 1386. Aldrov. Mus. Met. p. 670. Imperat. Hist. Nat. l. xxvi. c. 10. p. 619. Agricola de Nat. Foss. l. vi. Cæsalp. p. 93. Boet de Lap. p. 415. de Laet de Gem. p. 142. Dale's Pharm. p. 24. N°. 10.

Argilla indurata pallide virescens levis, quæ Lapis thyites Dioscoridis. Hill's hist. Foss. p. 30. N°. 2.

This clay is of a fine pale green colour throughout, without any admixture of any other colour; it is of an even and regular texture, of a smooth and glossy surface, very heavy and hard; it does not colour the hands, but drawn along a rough surface, marks a white line; it does not adhere to the tongue, does not melt in the mouth, but, when broken between the teeth, is of a sharp, acrid, and very disagreeable taste; in water it is not diffusible on account

account of its hardness, but when levigated on a marble, it readily dissolves into a milky substance without the least greeness remaining.

In the fire, it acquires a great hardness and a pale grey colour.

The ancients had it from Æthiopia.

Hill observes, he has seen specimens of the *morochtus*, which might have been taken for the *thyites*, but the latter, says he, evidently differs from it, by the equal and universal diffusion of the green, which, in the former, is always deeper, and laid in veins and streaks.

The taste and colour of the *thyites* are evidently owing to a considerable quantity of cupreous particles in it; the virtues Dioscorides ascribes to it, in distemperatures of the eyes, are also owing to the same cause, which makes it act as a weak kind of verdigrease.

This substance has been a great deal misunderstood among later writers, and is supposed by many to be lost. Fuchsius, who is refuted by Matthiolus, thought it to be the *turcois*, but Agricola and Imperatus rightly determined it to be of the *morochtus* kind.

IV. *Steatites indurata viridis.*

This is of a dull purplish green colour, hard, heavy, and of a firm compact texture, and of a smooth and glossy surface; it does not colour the hands, scrapes easily into a white powder, but does not mark when drawn over any rough surface; it does not adhere to the tongue, melts not in the mouth, but, when broken between the teeth, is soft and pure; in water it is not diffusible.

Burnt, it acquires a great hardness and a milk white colour.

This indurated green *Steatites*, agrees in many particulars with the *Thyites* of Dioscorides, just described, but however it evidently is a different species of earth.

This kind is found intermixed in masses with the other kinds of indurated *Steatitæ* in the soap rock in Cornwall, but pure pieces of it are very rarely met with.

S E R I E S I.

C A P. I. G E N U S III.

M A R L E S.

Earths slightly coherent, not in the least ductile or viscid while moist, most easily diffusible in, and disunited by water, and by it reduced into a soft loose incoherent mass.

S E C T. I. *The White* M A R L E S.

M E M B. I.

Marles which are not acted upon by acids.

I. *Marga alba quæ Terra Samia antiquorum.*

T E R R A *Samia*. Hill's Thophr. p. 145. Dioscor. l. v. c. 172. Plin. hist. Nat. l. xxxv. c. 16. Galen. l. v. Simpl. Avicenna l. ii. tract. 2. Cap. 422. Aldrov. Mus. Met. p. 239. Imperat. hist. Nat. l. v. c. 4, 5. et 16. Calceol. Mus. p. 113. Worm. Mus. p. 5. Mercat. Met. Vat. p. 15. et 23. Grew's Mus. Soc. Reg. p. 347. Charlt. de Foss. p. 221. N^o. 1. Tournefort Voyage to the Levant, Letter 10. Woodw. Meth. of Foss. p. 2. N^o. 4. et. Cat. of Foss. l. a. 18. Dale's Pharmacol. p. 22. N^o. 14.

Marga albissima mollis, quæ Terra Samia alba, et collyrium Samium Dioscoridis. Hill's hist. Foss. p. 38. N^o. 3.

A very fine pure earth, of a close compact and even texture, of a bright white colour, of a very smooth surface, and soft to the touch; it is friable and remarkably light, it does not colour the hands, but drawn along a rough surface marks a white line; it adheres firmly to the tongue, melts slowly in the mouth, is of a sub-astringent taste, and is very pure or free from grittiness; in water it is not so readily diffusible, as are most other earths of this genus.

It burns to a perfect whiteness, without any additional hardness.

It is found in the island of Samos. Theophrastus, whom Pliny copies, tells us, that the diggers in his time could not stand upright at their work, but were forced to lie along on their backs, or on one side, for that the vein of earth they dug ran lengthway, and was only of the depth of about two feet, tho' much more in breadth, and enclosed every way with stones.

The islanders at this time, Mr. Tournefort assures us, neither dig it, nor give themselves the trouble either to seek this earth, the asper, or the Samian stone of the ancients.

Mercator assures us, that both the kinds of Samian earths, are dug in the island of Elba, on the coasts of Tuscany.

The

The ancients prepared this Samian and the Aster earths, by burning and washing, and then used them with great success, internally in hæmorrhages and fluxes of all kinds, and externally in inflammations.

The ancient authors (1) mention the Samian earthen ware, as of great esteem. Pliny adds, that the Samians are reported to have found out the invention of making pottery ware, but whether they made their pottery ware of this earth of the Aster, or, as Mr. Tournefort imagines, of a fine deep red bole, which is found in great plenty in that island, particularly about Bavonda, or from a mixture of clays, we are left entirely in the dark.

Wallerius Mineralogy, species 27. erroneously places the *Cimolia*, the *Terra Samia*, and *Aster Samius*, as one kind of earth, and makes them to be the white tobacco pipe clay, or *Cimolia alba* of later writers; and of his second variety, which he synonyms *Leucargilla alba*, he says, the Samian earth, of which they anciently made earthen ware, was of this kind.

(1) Plautus in Captivis, *Samiis vasis utitur*.

Tibullus. *En! tibi læta trahant Samiæ convivia Testæ*.

Plin. l. xxxv. c. 12. *Sunt qui in Samo primos olim plasticen invenisse—Major quoque pars hominum terrenis utitur vasis. Samia etiamnum in esculentis laudantur.*

II. *Marga cinereo-alba quæ Samius Aster antiquorum.*

Diosc. l. v. c. 172. Plin. hist. Nat. l. xxxv. c. 16. Galen l. v. Simpl. Avicenna l. ii. tract. ii. c. 422. Aldrov. Mus. Met. p. 239. Imperat. hist. Nat. l. v. c. 4, 5, et 16. Calceol. Mus. p. 115. Worm. Mus. p. 5. Mercat. Met. Vat. p. 15. et 23. Charlt. de Foss. p. 221. Dale's Pharmacol. p. 22. N°. 14.

Marga friabilis albo-fusca scintillans, quæ Samius Aster Dioscoridis. Hill's hist. Foss. p. 39. N°. 4.

This is a marle of an ashen white colour, of a loose shattery plated texture, spangled with small glittering particles of *Selenitæ*, of a rough, dry, and dusty surface, it is easily broken and colours the hands; it adheres firmly to the tongue, melts readily in the mouth, but leaves a considerable grittiness; in water it is immediately diffusible, and falls into a fine powder.

In the fire, it acquires a pale ash colour, without any additional hardness.

It is found in the island of Samos.

The ancients prepared this earth in the same manner, and used it for the same purposes they did the other Samian earth, just before described.

III. *Marga alba quæ Terra Melia antiquorum.*

Terra Melia. Hill's Theophr. p. 142. Melinum Plin. hist. Nat. l. xxxv. c. 6 et 7. Aldrov. Mus. Met. p. 252. Imperat. hist. Nat. l. iv. c. 11. et c. 27. Worm. Mus. p. 6. Charlt. de Foss. p. 220. Mercat. Met. Vat. p. 23.

Terra

Terra candidissima ex Melo insula veteribus celebrata. Kentm. Nom. Foss. p. 1. N^o. 4.

Marga levis Cretacea friabilis alba, quæ Melinum Plinii. Hill's hist. Foss. p. 43. N^o. 9.

A fine light earth, of a very pure white colour, of a close compact and even texture, and of a smooth but not glossy surface; it is easily broken between the fingers, and slightly colours the hands, it adheres firmly to the tongue, melts readily in the mouth, and is perfectly fine and pure; in water it makes a great hissing noise, and a strong ebullition, first swells, and then breaks into fragments, and afterwards falls into a very fine powder.

In the fire, it burns to a pure white, without any additional hardness.

It is found in the island of Milo, from which it originally derived its name.

This earth was held in the greatest esteem for the use of painters, and was one of the four primitive colours, viz. the original white of the great painters of antiquity; it was also mixed with other substances, to make a size for gilding.

It was also used in medicine, and was reckoned to have the same virtues as the Eretrian earth.

SECT. I. MEMB. II.

Alcaline Marles.

IV. *Marga alba quæ Terra Cimolia antiquorum.*

TERRA *Cimolia.* Hill's Theophr. p. 144. Diosc. l. v. c. 176. Plin. hist. Nat. l. xxxv. c. 17. Galen. l. ix. Simpl. Avicenna l. ii. tractat. 2. c. 426. Aldrov. Mus. Met. p. 245. Mercat. Met. Vat. p. 17. et 23. Imperat. hist. Nat. l. v. c. 6. et 18. Tournefort Voyage to the Levant, Letter iv.

Marga alba ponderosa friabilis, quæ Terra Cimolia antiquorum. Hill's hist. Foss. p. 36. N^o. 1.

This is a very heavy marle, of a white colour, of a moderately compact and even texture, and of a smooth and somewhat unctuous surface; it is not difficultly broken between the fingers, and colours the hands; it adheres firmly to the tongue, melts freely in the mouth, and is insipid to the taste; in water it is immediately diffusible, without any effervescence or ebullition, and falls into a whitish uniform matter like cream, and is mixed with a great deal of small grit.

It burns to a fine white colour, with some additional hardness.

It is found in great quantities in the island of Argentiere, which was the *Cimolus* of the ancients, and from which it originally derived its name.

Mr. Tournefort, who inadvertently calls it a chalk, compares it to a kind of earth found about Paris; this earth about Paris is also mentioned in Hist. et Mem. of the Royal Academy of Sciences, anno 1710. where it is said, a stratum of it lies immediately over the plaister stone or gypsum; and in the said transactions of the Royal Academy of Sciences, anno 1716. Monsieur

de la Hire, likewise mentions it to be found in all the stone quarries about Paris, where it lies in strata intermixed with the stone, and is vulgarly called *Boufin* by the quarry-men.

Mr. Tournefort's comparison was extremely just for the above earth mentioned by him, is absolutely of this very kind of marle, as I have found upon the strictest tryals. It is found in the Mont martre gypsum pits, and there constitutes the first or upper stratum, and is from ten to fifteen and twenty feet thick, and small thin strata of it also lie intermixed with the thin strata of gypsum; in some parts it is found of a laminated structure, but that is not common. I cannot learn of any use it is put to, except that of taking spots out of cloaths, and on that account, it is vulgarly called by the workmen in those pits, *La marne pour degraisser les habits*.

The ancients held it in great esteem in medicine. Dioscorides and Galen have greatly celebrated it in their writings for its virtues, at present it is not at all used in medicine, but is yet applied to its ancient use, viz. of washing linen; the islanders of Argentiere make no other lye to wash with, but it does not wash so white as soap; this has been a very old custom there, since Pliny declares they made use of it in cleansing of stuffs in his time.

The moderns, having lost the knowledge of this earth, and the *Cimolia purpurascens* of the ancients, they have erroneously applied the name of *Cimolia* to the white tobacco pipe clays, and that of *Cimolia purpurascens* to the fullers earth; however there is no doubt that the *Cimolia* of the ancients was this marle, and it is extremely probable that their *Cimolia purpurascens*, was the same substance with our purple veined *Steatites*, as I have already observed.

V. *Marga alba quæ Terra Chia antiquorum.*

Terra Chia. Diosc. l. v. c. 174. Plin. l. xxxv. c. 16. Galen. l. ix. Simpl. Aldrov. Mus. Met. p. 247. Imperat. hist. Nat. l. v. c. 5. p. 112. Mus. Calceol. p. 125. Worm. Mus. p. 8. Charlt. de Foss. p. 222. N°. 6. Mercat. Met. Vat. p. 16 et 23. Dale's Pharm. p. 22. N°. 15.

Marga candida cinerea densa levissima mollior, quæ terra Chia antiquorum. Hill's hist. Foss. p. 40. N°. 5.

A marle of a pale ashen white colour, soft, dry, of a loose crumbly texture, of a laminated structure, and of a smooth surface; it easily breaks between the fingers, and slightly colours them; adheres firmly to the tongue, melts freely in the mouth, and is pure or free from grittiness; in water it makes a great ebullition, then swells, and after that gradually melts into a substance like thick cream.

It burns to a perfect whiteness, without any additional hardness.

It is dug in the island of Chio. The ancients used it in medicine, and esteemed it to have the same virtues as the Samian earth; they also used it in the baths to cleanse the body with instead of nitre; but its most celebrated use was as a cosmetic.

SECT. II. *The Ash and Grey Marles.*

MEMB. I.

*Alcaline Marles.*I. *Marga cinerea.*

WOODW. Cat. C. a. 18.

Marga cæruleo-fusca friabilis. Hill's hist. Foss. p. 44. N^o. 2.

This is a hard compact tho' light marle, of a deep ash colour, of a fine even regular texture, of a laminated structure, and of a smooth and slightly unctuous surface; it does not colour the hands, adheres slightly to the tongue, melts freely in the mouth, and is pure or quite free from grittiness; in water it is slowly diffusible.

In the fire, it acquires some hardness, and a reddish brown colour.

It is dug in Yorkshire and Suffex: Dr. Woodward found a stratum of it in the marble quarry at Petworth, in the latter county, and large masses of it are found in the great sand pits at Woolwich.

SECT. III. *The Red Marles.*

MEMB. I.

*Marles which are not acted upon by acids.*I. *Marga rubra.*

MARGA *friabilis ponderosa rubra.* Hill's hist. Foss. p. 46. N^o. 2.

This is a pure very weighty friable marle, of a fine red colour, variegated with a blueish earth, of a rough surface, but does not colour the hands; it adheres very firmly to the tongue, melts freely in the mouth, and is soon diffusible in water.

It burns to a darker red, with a considerable additional hardness.

It is dug in great quantities in several counties of this kingdom; and is much esteemed as a manure for poor hungry lands.

II. *Marga rubra altera.*

Marga rubra durissima. Hill's hist. Foss. p. 47. N^o. 4.

A marle of a pale red colour, variegated with blue or ash colour, and sometimes with white, very heavy, and extremely hard, of a smooth surface, and does not colour the hands; it adheres firmly to the tongue, melts difficultly in the mouth, and is somewhat impure; in water it raises a slight ebullition, and soon breaks into thin flat pieces.

In the fire, it acquires some hardness, and a deep red colour.

It is dug in many parts of this kingdom, and is esteemed as a very good manure.

III. *Marga rubra tertia.*

Marga arenosa friabilis sordide rubens. Hill's hist. Foss. p. 47. N°. 3.

This is a light and very loose or friable marle, of a clear brick colour, of a harsh rough and dusty surface, and colours the hands very much; it adheres slightly to the tongue, melts freely in the mouth, and is extremely impure; in water it is readily diffusible, and immediately falls into a loose powder.

In the fire, it acquires a little additional hardness, and a deep red colour.

It is dug in some parts of Ireland, and Hill says, it lies on or near the surface in great quantities, in Pensilvania, Virginia, and other parts of America.

I have not heard that it has yet been put to any use, tho' it seems to be a very good manure.

SECT. IV. *The yellow Marles.*

M E M B. I.

Marles which are not acted upon by acids.

I. *Marga lutea.*

M *ARGA arenosa lutea friabilis.* Hill's hist. Foss. p. 45. N°. 1.

A marle of a strong yellow colour, of a loose friable laminated texture, and spangled with small flat glittering talcy particles, of a rough dry and dusty surface, and colours the hands; it adheres firmly to the tongue, melts readily in the mouth, and is very impure; in water it is immediately diffusible,

In the fire, it acquires some little hardness, and a fine deep red colour.

It is dug in some parts of this kingdom, and is esteemed a good manure for stiff clayey lands.

Kentm. Nom. Foss. p. 6. N°. 10. exhibits a *Marga dura lutea arenosa*, *Belgica è trajectu superiore, qua incolæ sicuti in aliis locis, agros stercorant.* The which marle, I am apt to think, is only a variety of this species.

SECT.

SECT. V. *The brown Marles.*

MEMB. I.

*Marles which are not acted upon by acids.*I. *Marga viridi-fusca Terra Fullonica vulgo dicta.*

SMECTIS terra fullonica terra saponaria Anglica. Worm. Mus. p. 4. Merret's Pin. Rer. Nat. Brit. p. 218, Charlt. de Foss. p. 218. Bruckm. Epist. Itin. Cent. ii. Ep. 100. p. 1247. N^o. 36.

Fullers earth, or Cimolia purpurascens. Woodw. Meth. of Foss. p. 2. N^o. 1. et Cat. of Foss. A. a. 10, 11, et 12. Dale's Pharm. p. 21. N^o. 12.

Marga fullonum saponacea, lamellosa, Smeētis, Creta fullonia, Steatites, cimolia candida. Marga in bracteis debiscens Jonstoni. Wallerius's Mineralogy, species 29.

Marga cinereo-fusca mollis, quæ Cimolia purpurascens, Smeētis et Terra Saponaria authorum. Hill's hist. Foss. p. 49. N^o. 2.

The most common colour of the fullers earths is a greyish brown, but it greatly varies, and is also found from the pale greyish brown, to the dusky or near black, tho' ever with a cast of a yellowish green.

It is a hard dense marle, moderately heavy, of a very compact and regular texture, of a rough or dry appearance, tho' when cut or scraped, it is of a very smooth, unctuous, and glossy surface; it does not colour the hands, adheres but slightly to the tongue, melts freely in the mouth, and is a little impure; in water it is immediately diffusible, and falls into a fine soft powder.

In the fire it acquires a yellowish brown colour, and a stoney hardness.

There are many species of fullers earths mentioned by authors, but, by what I can find, this particular species of fullers earth is peculiar to this island.

It is chiefly dug in the counties of Bedfordshire, Surry, and Kent.

In Bedfordshire it is dug at Wavendon near Woburn, and the following account of these pits by the Revd. Mr. B. Holloway, is inserted in the Philosophical transactions, N^o. 379.

“ From the surface, for about six yards depth, there are several layers of sands, all reddish, but some lighter coloured than others, under which there is a thin stratum of red sand-stone, which they break through; and then for the depth of seven or eight yards more, there is sand again, after that they come to the fullers earth; the upper layer of which, being about a foot deep, they call the *cledge*; and this is by the diggers thrown by as useless, by reason of its too great mixture with the neighbouring sand, which covers, and has insinuated itself among it; after which they dig up the earth for use, to the depth of about eight feet more, the matter whereof is distinguished into several layers, there being commonly about a foot and a half between one horizontal fissure and another. Of these layers of fullers earth, the upper half, where the earth

breaks

breaks itself; is tinged red; as it seems by the running of the water, from the sandy strata above; and this part they call the *crop*; betwixt which and the *ledge* abovementioned, is a thin layer of matter not an inch in depth, in taste, colour, and consistency, not unlike to *Terra Japonica*. The lower half of the fullers earth they call the *wall earth*; this is untinged with that red abovementioned, and seems to be the more pure and fitter for fulling; and underneath all is a stratum of white rough stone, of about two foot thick, which if they dig through, as they very seldom do, they find sand again, and then is an end of their works.

One thing is observable in the site of this earth, which is, that it seems to have every where a pretty equal horizontal level; because they say, that when the sand ridges at the surface are higher, the fullers earth lies proportionably deeper.

The perpendicular fissures are frequent, and the earth in the strata, besides its apparent distinction into layers, like all other kinds of matter, by reason of its peculiar unctuousness, or the running of the adjacent sand imperceptibly among it, breaks itself into pieces of all angles and sizes.

In Surry it is dug at Reygate, Nutfield, and the other adjacent places, in a space of ground of some miles extent, the soil of which is sandy; the pits are dug like wells; the strata, according to my observations, are as follow; the soil is sandy, and about five feet deep, under that lies a stratum of a coarse sand-stone, in large flattish masses, and is about four feet thick; then the stratum of fullers earth, which commonly is about twenty seven feet thick. This marle does not constitute a solid stratum as most other earths, but is always found in rude irregular masses of various sizes; the stratum appeared of many colours, as rusty on the surface in some places, greenish and yellowish in others, all very irregular, sometimes greatly distant, in other places joining in the same mass of fullers earth. The rust coloured spaces are caused by a harsh ochreous substance of that colour, which is found mixed with the earth; I could not observe any fossils either native or extraneous lodged in the stratum of the fullers earth, except a fine ponderous crystalline spar hereafter to be described, and the diggers assured me, no other kind of fossil is ever found in these pits.

The above described disposition of strata, is observed in all this extent of ground; however, in some places the sand stone forms a thicker stratum, so as to be sometimes about ten feet thick, and consequently the stratum of fullers earth lies deeper.

In Kent it is dug at Detling, two miles beyond Maidstone: Dr. Woodward gives us the following account of the strata of these pits, *viz.* the soil is a common vegetable mould, about two feet thick, under it lies a stratum of loam, abounding with sand twenty five feet thick; in this loam a great variety of shells is found, then a stratum of a fullers earth of a dark grey colour, approaching to black, about five feet thick, under which lies another fullers earth, the stratum whereof is about a foot thick; in the strata of fullers earth, they likewise sometimes find the same kinds of shells as are found in the loam, but they are generally much rotted and decayed. The Dr. further observes, that the workmen sink for fullers earth in several places in the ground all round, and find

find the strata of mould, loam, and fullers earths, every where lying in the same order, and of much the same dimensions with those set forth above.

The use of fullers earth in medicine, taken internally, says Dale, is hardly any, externally it dries and is astringent.

The uses of it for the woollen manufactory are so great, that I cannot give my reader a better idea of them, than in transcribing what that great naturalist Dr. Woodward has wrote on this subject. "Fullers earth, says the Doctor, is a thing of great service and importance; one main property of it is to imbibe oil, grease, and other like unctuous matter; it is that property that renders this earth so useful in the cleansing woollen cloth. Every body conversant in rural affairs, must needs know how frequently tar is of necessity employed, as also grease and tallow, in the external affections and diseases of sheep; and besides, their wool cannot be worked, spun, or wove into cloth, unless it be well oiled and greased; all which unctuous matter must be taken forth again out of the cloth before it can be worn; nor is any thing yet known so serviceable to that purpose as this earth; and as the fullers earth of England is got in great plenty, so it very much exceeds any yet discovered abroad in goodness, which indeed is one great reason, why the English surpass all other nations in the woollen manufacture; and to preserve the benefit of this to the country, and secure it from the usurpation of foreigners, the exportation of English fullers earth is strictly prohibited by act of parliament."

II. *Marga fullonica altera.*

This is a dense clayey marle, rather of a lighter colour than the common fullers earth, with yellow veins and spots of an earthy matter; it is of a regular texture, heavy, moderately hard, of a smooth surface, and cuts or scrapes glossy and unctuous; it does not colour the hands, does not adhere to the tongue, melts pretty freely in the mouth, and leaves some grittiness; in water it is difficultly diffusible, and falls into pieces, which are very viscid.

In the fire it acquires a great hardness, and an ashen colour.

This earth has lately been discovered in Hampshire and Wiltshire, and is now greatly used at Salisbury in the woollen manufactory, as a fullers earth.

III. *Marga cinereo-fusca.*

A dense clayey marle, of a deep ashen brown colour, of a smooth surface, but not in the least unctuous or glossy, heavy and hard, of a pretty compact and firm texture, and glittering with exceeding small silvery spangles; it does not colour the hands, does not adhere to the tongue, melts readily in the mouth, and is extremely impure or full of grittiness; in water it raises an ebullition, and soon falls into a viscid powder.

In the fire it acquires a stoney hardness, and a pale red colour.

It has not as yet been put to any use.

The high cliffs on the back of the island of Sheppey in Kent, are composed of this marle, and in this earth the *selenitæ*, *pyritæ*, *septariæ*, and other fossils

fossils both native and extraneous, for which this island is famed, are found lodged.

IV. *Marga fusca friabilis.*

Hill's hist. Foss. p. 48. N^o. 1.

This is a loose, light, and crumbly marle, of a pale brown colour, and is sometimes, tho' seldom, variegated with grey or black; it is of a rough, dry, and dusty surface, and colours the hands; it adheres very firmly to the tongue, melts freely in the mouth, but leaves a considerable grittiness; in water it raises a great ebullition, and a loud hissing, and immediately falls into a soft powder.

In the fire it burns to a pale red, and acquires a little hardness.

It is dug in Suffex, and makes a fine rich manure for grass land.

V. *Marga indurata viridi-fusca.*

This is an indurated marle, of a dusky brown colour, with a very strong cast of dusky green, moderately heavy, of a firm, close, even, and regular texture, of a smooth, unctuous, and slightly glossy surface; it does not colour the hands, adheres firmly to the tongue, melts freely in the mouth, is quite pure, and in water is soon diffusible.

In the fire it acquires a great hardness, and a pale reddish brown colour.

It is a fine species of fullers earth.

VI. *Marga indurata luteo-fusca.*

This is an indurated marle, of a strong yellowish brown colour, moderately heavy, of a firm, close, even, and regular texture, of a smooth, unctuous, and glossy surface; it does not colour the hands, adheres firmly to the tongue, melts freely in the mouth, and is quite pure or free from grittiness; in water it is soon diffusible.

In the fire it acquires a considerable hardness, and a coffee colour.

This earth is found in quantities, lying in streaks or small veins, along with veins of a poor iron ore, in a sandy soil, in the sides of a hollow way at Boff-bridge, near Godalmin in Surry.

It has not as yet been put to any use, but as it is so fine a species of fullers earth, it greatly deserves to be carefully sought after.

SECT. VI. *The blue Marles.*

MEMB. I.

Marles which are not acted upon by acids.

I. *Marga cœrulea.*

MARGA *argillacea subcœrulea.* Hill's hist. Foss. p. 44. N°. 1.
This is an earth of a pale blueish colour, generally veined or spotted with red, heavy, of a dense hard texture, and of a rough unequal surface; it does not colour the hands, scarce at all adheres to the tongue, melts freely in the mouth, and is impure; in water it is immediately diffusible, and soon falls into a fine powder.

In the fire, it acquires a considerable hardness, and burns to a brown colour.

It is dug in several parts of this kingdom, and is used for manure.

II. *Marga cœrulea altera.*

Marga cœruleo-fusca durissima, quæ Marga Columbina Plinii. Hill's hist. Foss. p. 45. N°. 3.

This is a stoney heavy marle, of an ashen blue colour, of a firm laminated texture, of a rough unequal surface, and does not colour the hands; it adheres slightly to the tongue, melts difficultly in the mouth, and is very impure; in water it is soon diffusible.

In the fire, it acquires a dull dusky red colour, but no additional hardness.

It is dug in many parts of this kingdom, and is used for manure.

Hill determines this marle to be the *columbina* of Pliny, l. xvii. c. 8. but upon what foundation he can do so, is to me unknown, since Pliny mentions not the colour of his *Marga columbina*; and besides the short description he gives of it is equally applicable to some other marles, as well as to this species.

SECT. VII. MEMB. I.

Marles which are not acted upon by acids.

I. *Marga indurata viridescens.*

THIS is a fine pure indurated marle, of a pale greyish green colour, or exactly of that colour which melted fat or tallow takes, when dropt on a piece of brass, the which substance it also resembles in several other respects, of a close, even, and regular texture, heavy, of a smooth, unctuous, and glossy surface;

surface; it does not colour the hands, slightly adheres to the tongue, melts readily in the mouth, and is quite soft and pure; in water it immediately swells and falls to pieces.

Burnt, it acquires a great hardness and a pale white colour.

I received this marle, which is as fine a fullers earth as ever I saw, from Turkey, and was informed, it is used in their baths, and is held by them in great esteem.

I do not doubt this is the species of fullers earth, exhibited by Woodward, Cat. L. a. 15. and which he describes to be grey with a cast of green, smooth, unctuous, detergent, and absorbent, and, indeed, says the Doctor, one of the finest fullers earths I ever saw: It is dug in great quantities near Caffa, a principal city in the lesser Tartary, and the Turks and Tartars call it *Cassaca*, and make use of it in their baths.

It is dug in several parts of this kingdom, and is used for manure.

II. *Marga cerulea*.

This is a stony heavy marle, of an ashen blue colour, of a firm laminated texture, of a rough unequal surface, and does not colour the hands; it adheres slightly to the tongue, melts difficultly in the mouth, and is very impure; in water it is soon dissoluble. In the fire, it acquires a dull dusky red colour, but no additional hardness. It is dug in many parts of this kingdom, and is used for manure. I still determine this marle to be the *Marga cerulea* of Pliny, l. xvii. c. 8. but upon what foundation he can do so, is to me unknown, since Pliny mentions not the colour of his *Marga cerulea*; and besides the short description he gives of it is equally applicable to some other marles, as well as to this species.

SECT. VII. M. M. B. I.

THIS is a fine pure indurated marle, of a pale greyish green colour, or exactly of that colour which melted fat or tallow takes, when dropped on a cold plate, the which substance it also resembles in several other respects, of a close, even, and regular texture, heavy, of a smooth, unctuous, and glossy surface.

SERIES

S E R I E S I.

C H A P. II.

Earths of a looser texture, and which to the touch are dry, harsh, and rough.

G E N U S I.

C H A L K S.

Earths generally hard and dry, harsh and rough to the touch, and readily diffusible in water.

S E C T. I. *The Black CHALKS.*

M E M B. I.

Chalks which are not acted upon by acids.

I. *Creta nigra.*

CRETA *nigra dura.* Kentm. Nom. Foss. p. 8. N^o. 12.
Creta nigra fabrilis. Bruckm. Epist. Itin. Cent. iii. Ep. 2. p. 14.
 This is a chalk of a fine black colour, of a hard compact regular texture, and of a laminated structure, it generally breaking horizontally; it is not dry or harsh to the touch, but is rather slightly smooth, it colours the hands, and freely marks on paper; it does not adhere to the tongue, melts difficultly in the mouth, and is quite free from grittiness; in water it is difficultly diffusible.

Burnt, it acquires a white colour, and becomes friable.

It is found sometimes in the Derbyshire and Flintshire coal pits; it generally forms a stratum about two and twenty yards deep, and three yards above the coal. I have chiefly met with it in the collieries at Shipley near Derby, where great numbers of small *cuneitæ* are generally found lodged in it; the colliers there call it black shale. In the Flintshire coal-pits, it also lies just over the coal.

There are pits of this chalk at Miegbecke or Krietbecke, and Essen, near Osnabrug in the circle of Westphalia; the inhabitants dig great quantities of it, which they carry for sale to Holland; and it is also greatly used by them for several mechanical purposes.

I have likewise received it from the mines of Clausthall, in the electorate of Hanover.

S E C T. II. *The White* CHALKS.

M E M B. I.

*Chalks which are not acted upon by acids.*I. *Creta, Tripela alba dicta.*

WOODW. Cat. I. a. 41. Bruckm. Epist. Itin. Cent. iii. Ep. 10. p. 89.
Tripela albissima, quæ Creta argentaria antiquorum. Hill's Hist. Foss.
 p. 67. N^o. 1.

This is of a white colour, of a loose friable texture, light, moderately hard, and of a harsh rough dusty surface; it slightly colours the hands, adheres to the tongue, breaks immediately in the mouth, into a coarse and very hard powder; thrown into water, it makes a slight ebullition, and after some time falls into powder.

In the fire it acquires some hardness, without any change of colour.

It is dug at Scheubenberg in Saxony, at Sonderhausen in the duchy of Schwartzburg, and on Mount Wurmberg on the Blockberg, or Mons Bruëterus in the duchy of Brunswick.

The specimen Dr. Woodward exhibits, he received from France.

Smith, in his civil and natural history of the county of Cork, in Ireland, Vol. ii. p. 383. exhibits a variety of this *Tripoli*, which, he says, is vulgarly called free stone; it is dug at Glenafouky, north of Cork, and is greatly used at Cork; this variety on burning grows harder, and acquires a reddish cast on the surface.

Hill erroneously affirms, this *Tripoli* to be the *Creta argentaria* of the ancients; with what reason he can assert such an error, will fully be set forth in the description of common chalk.

II. *Creta albissima.*

A very elegant and fine chalk, of a resplendent and beautiful snow white colour, moderately hard and heavy, of a close, compact, regular, and fine texture, not of a harsh and dusty surface, but somewhat smooth; it colours the hands, adheres firmly to the tongue, melts readily in the mouth, and is quite pure. In water it raises a great ebullition, and immediately breaks into a very fine powder.

Burnt, it becomes friable, but suffers no change of colour.

It is said to be dug in some parts of Germany, as also in America.

M E M B. II.

*Alcaline Chalks.*III. *Creta vulgaris.*

DIOSC. Galen l. iv. Simpl. Avicenna l. ii. tract. 2. c. 425. Aldrov. Mus. Met. p. 241. Worm. Mus. p. 3. Mercat. Met. Vat. p. 19. Merret's Pin. Rer. Nat. Brit. p. 218. Charlt. de Foss. p. 218. N°. 2. Woodw. Cat. A. a. 60. Dale's Pharm. p. 24. N°. 1.

Creta argentaria. Plin. Hist. Nat. l. xvii. c. 8. et. l. xxxv. c. 17.

Creta subrupestris alba. Linn. Syst. Nat. p. 206. N°. 1.

Creta coherens solida, Creta argentaria. Wallerius's Mineralogy, species 8.

Marga siccior et pulverulenta, alba, Creta dicta. Hill's hist. Foss. p. 43. N°. 10.

Of a white colour, of a close compact solid texture, of a very harsh dusty surface, moderately hard and heavy; it greatly colours the hands, adheres to the tongue, and melts slowly in the mouth; in water it raises an ebullition, and diffuses slowly into a fine powder.

It burns to lime.

It derives its name from the island of Crete, now called Candia, where the best was formerly found; it is now found in the archbishoprick of Cologne in Germany, in Denmark, and in France, but in the greatest quantity in this island.

The chalk is found in large strata chiefly in the south east part of this island; and if a straight line was drawn on a map from Dorchester in Dorsetshire, to the coast of Norfolk, it would almost intirely include the chalky strata of this island, for no quantity of chalk is dug beyond that line.

The uses of chalk are many in medicine; it is a most noble absorbent, and most powerfully corrects and subdues acrid humours in the stomach; tempering and allaying the emotions and ebullitions of them; this property is what renders it so serviceable in that disorder called improperly the cardialgia or heart burn; it is also of great relief in the cure of diarrhoeas or fluxes; and in the London dispensatory it gives name to a julep, which is prescribed in cases abovementioned.

It is used externally to dry up ulcers, wounds, &c. says Dale.

The *Magnes aeris*, of which see Frid. Hoffm. in Obs. Phys. Chym. Select. l. iii. p. 178. is a preparation of chalk with spirit of wine.

Its mechanical uses are many. It is laid on lands, both native, and burnt into lime. The use of lime in building is well known, nor is it entirely rejected in physical uses. The other mechanical uses of chalk for cleansing metals, &c. need no recital; it is also used in the baking of sugars, and in making glass; and beer soured by the weather, is again recovered with chalk.

In chemistry it is the basis of the solid hermetic phosphorus, first made by Mr. Baldwin, a German lawyer; who, tho' he wrote a particular treatise on it, yet gave no directions for the making of it, nor doth he so much as mention the materials. Dr. Francis Slare, however, afterwards made it, and presented it

to the *Royal Society* in 1679. The process, as imparted by the Doctor, to the *Royal Society*, which is published by Dr. Grew in his *Mus. Reg. Soc.* p. 353. is as follows.

Take good firm *chalk*, ignite it in a *crucible*, and then powder it. Put into a pint or half a pint of strong *spirit of nitre*, *cochleatim*, as much hereof as will serve well to satiate it, i. e. till it becomes sweetish, and makes no *effervescence* upon the injection of the *chalk*. Then dilute this liquor with fair water, filtre it through a paper, and so evaporate it in a large glass, or glazed vessel, or good *Hessian crucible* to a dry *salt*. The preparation whereof may be performed in four hours.

The main business lies in the good *enchiresis*; about which these several directions must be carefully observed.

First you must prepare a vessel of clay, somewhat like a shallow *coffee dish*, of three, four, or five inches in diameter, and an inch in depth, very well baked and nealed. Then place it under a muffle, after the manner of a refining furnace, in the place where the cuppels usually stand: and so make it red hot. Then put the prepared *salt* into it, by little and little, not above one and a half or two drachms at a time. Keep the fire to that degree, which will suffice to make the *salt* boil in the dish, so as to spread itself every way, and creep up the sides of it. Before the *salt*, last put in, be consumed, be sure always to be ready, to make a new addition, otherwise your labour so far is lost, and you must begin again. When five or six drachms are fumed away, take the dish nimbly out of the fire, so soon as the *salt* last put in is dry. If you have wrought well, what remains in the dish will be yellowish in some parts, and every yellow part will shine. Secure this matter from the air, by fitting and cementing a glass to it, otherwise it will lose its property in one week.

This phosphorus being exposed for about half a minute to the sun, or only to day light, or to a bright fire or candle, will shine in the dark for some minutes.

Mr. Haac, continues Dr. Grew, hath frequently repeated the following experiments on this phosphorus; if it be exposed to the morning light, a little before sun rising, it presents a bright rosy hue. As the sun approaches the *meridian*, it advances to a higher and more fiery complexion, like that of a red hot iron. A little after sun set, it declines to a pale wan colour, like *chalk*, or rather *mother of pearl*.

Exposed to the light of a candle, or flaming faggot, it receives a pale luminous colour, as from the sun towards setting. But being exposed for a considerable time to the most clear moonshine, he could not perceive it to become luminous in the least.

It hath been kept in the vacuum of the Honourable Mr. Boyle, called from him the *Vacuum Boyleanum*, for above four or five months, without any diminution of its shining property.

As to the cause of this strange *phenomenon*, Dr. Slare offers his thoughts to this effect. Two questions, says the Doctor, may arise: What it is in this mixture that yields the light? And how it doth it? As to the first, I take it to be the pure fiery part of the *spirit of nitre*, embraced by the *chalk*. For that the rest is weak and phlegmatic; as appears, if it be distilled. Also, that about the end of the operation, a black fume begins to rise and fly away. That

if by continuing the dish too long in the fire, you drive all the *nitrous* parts away, the *chalk* which stays behind will not be luminous. Or if the matter duly prepared, be exposed to the air, and thereby preyed upon, the same effect will follow.

As to the second, I suppose, that it shines not by imbibition of light, but by impression from it, from whence proceeds a motion therein productive of light.

Dr. Grew then adds his own conjectures of the subject and cause of light in this *phosphorus*. What it is which gives the light, says the Doctor, it seems hard to say, whether it be the *cretaceous salt*, the *nitrous salt*, or some *igneous particles* incorporated with them in the operation?

As to the question, how these *particles* give light, I am inclined to believe, all the three bodies abovementioned, serve together to compose an apt recipient of light. That, as in the mixture of *sulphur* and *water*, *sulphureous salts*, of affinity with both, are used as a medium: so here, the *cretaceous* parts serve to fix the *nitrous*, and the *nitrous*, to fix the *igneous*, being of a middle nature, and readily incorporated with them both. And being in this union exposed to the sun beams, or other light, the *igneous* parts serve, for some time, to retain a certain portion of such as are luminous, or to give, as I may say, a degree of fixation to these also: and that therefore this mixture is kindled or made to shine, by putting it into the light, as a stick is made to burn, by putting it into the fire.

Most of the authors who have written on fossils, have been very assiduous in making the *creta argentaria* of the ancients, a different species from our common *chalk*. Hill has even been pleased to make a *tripela* of it: this error, however, is but one of very many instances, that might be alledged of this gentleman's inadvertence and precipitancy: for, on duly considering what Pliny has expressly said, we can find no reason to conclude the *Creta argentaria* any other than the common chalk. Pliny l. xxxv. c. 17. begins the chapter with informing us, there were many kinds of chalks, *Cretæ plura genera*; he then proceeds to his account of them, as the *Cimolia*, the *Thessalica*, the *Sarda*, the *Umbrica*, and the *gypsum tymphaicum*, he continues, *alia creta argentaria appellant, nitorem argenteum reddens*; but in l. xvii. c. 8. he is quite clear; where, talking of manures for lands, *Alterum genus*, says that author, *albæ cretæ, argentaria est. Petitur ex alto in centenos pedes ætæ plerumque puteis, ore angustatis: intus ut in metallis spatiente vena: hac maxime Britannia utitur.* Pliny's description of the manner of digging the *creta argentaria*, is so accurate, and so exactly corresponds with the ancient way of digging chalk in this island, and which is still continued in some few places, that it is a pity an author should take upon him to clear up the writings of the ancients, who has not duly informed himself of the common things of his own country: in some places on the downs of Surry, as also in Hertfordshire and Buckinghamshire, they still dig chalk in the exact manner Pliny has described; they dig pits like wells, and at the bottom of the well they cut the chalk (which they draw up with buckets) in an arched way, about sixty feet long, and forty feet high, which when done they cease working in that pit or well, and dig another. These remarks, I doubt not, fully prove the *creta argentaria* of the ancients, to be our chalk.

Errors in natural history are easily propagated, Dr. Meara, in Childrey's Britannia Baconica, p. 40. having found some unslaked lime on Lansdown near Bath, which he did not know to be lime, he called it *a chalk as white as snow, which, being tasted, was attended with a biting and heat in the mouth, and being put into cold water, raised an ebullition and heat like quick lime*: he even took it to be the cause of the *heat of the water of the Baths*. This error, tho' it is taken notice of, and is fully refuted by Dr. Woodward, Cat. of Foss. p. 242. r 2. yet has still unfortunately prevailed; for Dr. Bruckman, a German author of note, in his Magn. Dei in locis Subterraneis, vol. ii. p. 17. and Wallerius, a learned and famed Swedish author, in his Mineralogy, species 9. have made a species of chalk from this unslaked lime, by the name of *Creta aqua frigida effervescens, Creta Balnei Bathensis*.

Henckel, in his treatise *De Lapidum Origine*, as also many other naturalists, advance, that chalk is a primitive earth, and naturally such from the beginning. Neumann, in his *Prælectiones Chymicæ*, on the contrary, asserts, that chalk is only a decomposition of the flint, which being reduced by subterranean and other vapours into a sandy substance, chalk is produced from it. Wallerius, however, abides by neither of these authors opinions, but says, that both these systems may be reasonably allowed.

IV. *Creta alba Italica.*

A very fine kind of chalk, of a dull white colour, hard, moderately heavy, of a compact solid and regular texture; it colours the hands, adheres slightly to the tongue, melts readily in the mouth, and is quite pure and free from grittiness; in water it raises an ebullition with some hissing, and immediately falls into a fine powder.

In the fire it acquires some hardness, but suffers little change of colour.

This chalk is dug in the duchy of Mantua in Italy.

It is greatly used by painters; at Rome it is vulgarly called *gesso*, but in the Mantuan territories it is called *bianchetto di pittori*.

V. *Creta alba, Calx nativa dicta.*

Gypsum tymphacium f. *tymphaicum*. Hill's Theophr. p. 149. Pliny hist. Nat. l. xxxvi. c. 17.

Calx nativa. Woodw. Cat. A. a. 40.

Creta pulverulenta humacea, alba, vel cinerea. Calx nativa, Woodward. *Terra aceldema Nieremberg*. Wallerius Mineralogy, species 13.

Marga fungosa, candida, durior, alkalina, quæ calx nativa quorundam et gypsum tymphacium Theophrasti. Hill's hist. Foss. p. 42. N°. 8.

This is a dry harsh coarse earth, of a dull whitish colour, with a yellowish cast, and of a loose or not very compact texture; it adheres firmly to the tongue, does not colour the hands, melts slowly in the mouth, and is impure; in water it raises a considerable ebullition and hissing, and makes an excellent plaister or cement without previous burning.

In

In the fire it acquires a white colour, without any additional hardness.

Theophrastus and Pliny inform us, this earth was anciently esteemed for the cleansing of cloths, but at present I do not know that it is put to any use.

It is found in some parts of this island. Mr. Morton sent it to Dr. Woodward, from Clipston quarry in Northamptonshire; and Hill asserts, he has found it in Mr. Allen's quarries near Bath, and also near Goodwood in Suffex.

Wallerius makes two varieties of this chalk, which he synonyms, *Calx nativa humo mixta*, as being always mixed with other earthy parts, and *Calx nativa aquis supernatans, vel mixta. Flos calcis.* Kundman. *Cremor therms supernatans.* Hoffman. which, says he, is always found with mineral waters, either floating on them, or mixed with them.

The said author further observes, that if what Nieremberg relates of his *Terra aceldema* be true, viz. that if a dead body be laid in it, it will be consumed in four and twenty hours, it must necessarily be a calcareous earth of this species, since no other genus of earths, but the calcareous, are capable to produce such a phaenomenon.

Leopold, Epist. de Itin. suo Suecico, p. 100. mentions a *Terra alba sive Creta arenearum impatiens, aliis calx nativa dicta*, found at Oerberg near Vadsten, a city of Ostro Gothia in Sweden, which may likely be of this species of chalk.

VI. *Creta albescens, Terra Melitensis dicta.*

Terra Melitensis, Terra di Malta, Gratia Sancti Pauli, Pietra di S. Paolo, Magnes albus. Matthiol. in Diosc. l. vi. c. 40. Aldrov. Mus. Met. p. 253. Imperat. Hist. Nat. l. v. c. 37. Calceol. Mus. p. 130. Worm. Mus. p. 6. Th. Barthol. Cent. vi. Hist. Anat. p. 196. et Epist. Med. Cent. i. Ep. 53. p. 223. Kircher Mund. Subt. l. vii. p. 359. P. Boccone Mus. di Fis. e di Esperienze Offerv. vii. p. 53. Grew's Mus. Reg. Soc. p. 347. Charlt. de Foss. p. 222. Ray's Travels, vol. i. p. 262. Ol. Jacob. Mus. Reg. Dan. p. 39. Woodw. Meth. of Foss. p. 3. N^o. 14. Mercat. Met. Vat. p. 17. Kundm. Promp. p. 296. N^o. 8. a. 20. et Rar. Nat. et Art. Sect. i. Art. 30. p. 243. Valent. Mus. Museor. p. 2. et Aurifod. Med. p. 2. Dale's Pharm. p. 24. N^o. 2. Bruckm. Epist. Itin. Cent. iii. Ep. 7. p. 51.

Marga friabilis levis albescens, quæ Terra Melitensis authorum. Hill's hist. Foss. p. 37. N^o. 2.

This is of a dull white colour, inclining to that of mortar, light, of a loose friable texture, and harsh, dry, and rough to the touch; it slightly colours the hands, it adheres firmly to the tongue, melts readily in the mouth, is slightly astringent to the taste, and somewhat impure; thrown into water, it raises a slight ebullition, and soon falls into a fine powder.

In the fire it acquires a considerable hardness, and a pale ashen colour.

It is found in great plenty in the island of Malta, in a grotto nigh La Citta Vecchia, and is by the inhabitants vulgarly called *Gratia di S. Paolo*.

It is an alexipharmic, an astringent, and a powerful alkaline absorbent; the use of it is extolled in pestilential and malignant fevers, and in all other dis-

tempers proceeding from the acids; it is also esteemed as a remedy against the bites of venomous animals, which virtue is superstitiously believed to have been granted it by St. Paul, when he was shipwrecked on this island, at the same time that he deprived the venomous animals of the island of their poison. Wormius has given himself the trouble to transcribe a printed Italian account of this its sanctified virtues, while Matthiolus, on the contrary, has gone so far as to deny it any miraculous virtue at all.

The inhabitants make it up into small cakes, which they stamp with above fifteen different impressions of saints, especially St. Paul.

VII. *Creta fungosa albissima, Agaricus mineralis, et Lac Lunæ dicta.*

Steinomarga f. Lithomarga, Agaricus mineralis f. saxatilis, f. fungus Petreus, et Lac Lunæ. Agricola de Nat. Foss. l. ii. p. 578. Gesner de fig. Lap. p. 50. Imperat. hist. Nat. l. v. c. 41. Schwenckf. Cat. Foss. Siles. p. 384. Worm. Mus. p. 5. Boet. de Boot, de Lap. l. ii. c. 299. Plott's Nat. hist. Oxford. c. 3. p. 60. Grew's Mus. Reg. Soc. p. 347. Joh. Dan. Major. Diff. de Lacte Lunæ. Wagner hist. Nat. Helv. p. 340. Koenig. Regn. Min. Sect. iv. P. iii. p. 395. J. J. Scheuchzer's hist. Nat. Helvetiæ, P. ii. p. 183. et P. vi. p. 107. Ej. Iter. Alp. 4. anno 1705. Valent. Mus. Museor. P. ii. p. 4. c. 1. § 4. et Aurif. Med. p. 3. Woodw. Meth. of Foss. p. 4. N°. 20. et Cat. A. a. 62. Cat. I. a. 49. et Cat. L. a. 28. et 29. Langius's hist. Lap. fig. Helvetiæ, p. 6. Bayer Oryctogr. Norica, p. 17. Bruckm. Epist. Itin. Cent. iii. Ep. 10.

Lac Lunæ vel Agaricus terrestris, sive saxatilis, nonnullis Terra Samia. Mercat. Met. Vat. p. 23.

Terra farinacea, agaricus Petreus, Morochtus. Mus. Richt. p. 144.

Morochtus. Aldrov. Mus. Met. p. 222.

Marga f. Farina mineralis. Kundm. Prompt. p. 302. N°. 126. Bruckm. Epist. Itin. Cent. i. Ep. 15.

Marga argillacea albida. Linnæus's Syst. Nat. p. 204. N°. 1.

Marga fungosa friabilis albissima levis, Agaricus mineralis, et Creta Seleneusiaca dicta. Hill's hist. Foss. p. 40. N°. 6.

Creta friabilissima, levissima, non cohærens; Lac Lunæ; Agaricus mineralis. Wallerius's Mineralogy, species xi.

This chalk is found of different degrees of purity and colour: it never constitutes a stratum in the earth, but is found adhering to the roofs and walls of grottoes or caverns, and lodged in the fissures of strata of stone, sometimes in form of a farinaceous powder, sometimes concreted into masses; when quite pure, it is of a fine bright white colour, extremely light, of a loose friable texture, and of a harsh, rough, and dusty surface; it colours the hands greatly, adheres to the tongue, melts freely in the mouth, is insipid to the taste, and leaves no grittiness; thrown into water, it raises an ebullition, and soon falls into a fine white powder.

The varieties of this chalk, as has been already observed, are many, owing to its greater or lesser purity, and to the other mineral substances found accompanying it; some varieties adhere not at all to the tongue, nor do they melt readily in the mouth, or in water; some are of a very loose spongy texture,

texture, and others of a smooth, even, and pretty compact texture; in like manner some are very pure and free from grittiness, while other varieties, which are generally mixed with sparry matter, are extremely impure; their colours likewise vary much; I having observed of them from the clearest brightest white, to a very dull dusky white colour, like mortar.

In the fire it suffers no change.

The *Lac Lunæ* is found in many parts of Europe; the most famous places are the Moon loch or cavern of the moon, (so denominated from the great quantity of this chalk, which in many places incrusts the roof and walls of this cavern a foot thick,) on Mount Pilatus, or Frachmœndt, in the canton of Lucerne; also in a grotto at Stockhorn, in the canton of Bern; and in a cave on the high mountain Wallenstock, in Switzerland; in several parts of Italy, in many caverns of Hungary, in Kaversheim and Velden grotto's, near Nuremberg, and many other parts of Germany; and Wormius received this chalk from Norway, and the islands of Fero.

It is also found in some parts of Asia and America.

In England we are not destitute of this earth, tho' it is not found in any considerable quantities; the quarries of Oxfordshire afford it; and Dr. Woodward received it from the slate quarries at Colly Weston, in Northamptonshire; the said author further informs us, it is very frequently found in the fissures of the stone, in great plenty, in the quarries about Sherborne in Gloucestershire, loose, in the perpendicular fissures, along with the spar; and in many of the quarries of that county, of Northamptonshire, and the neighbouring counties. I have likewise found it, greatly mixed with spar, in small quantities, in the coal pits of Leicestershire and Derbyshire.

Its uses in medicine are many; it is an excellent absorbent, and good in all diseases proceeding from the acids; in hæmorrhages, in diarrhœas, dysenteries, the gravel, malignant fevers, &c. it has been used in the German practice with great success, externally it is used for the drying of ulcers of all kinds.

By the slight account which the ancients, viz. Diosc. l. v. c. 175. Pliny l. xxxv. c. 16. et Galen l. ix. Simpl. have left us of their *Terra Selenusia*, it probably was a earth of this species.

Authors have described many earths which are only varieties of this species, by other names; these, therefore, ought to be ranged under this head; the chief of them areas follow:

1. *Tbicatlalli* f. *Terra alba Mexicana*. Hernandez Nova Plant. Animal. et Mineral. Mexicanorum Hist. l. x. c. 21. De Laet Indiæ Occident. Descr. l. v. c. 6. Francisci Ind. Lustgarten, p. 1160. *Terra è lacu Mexicano nivea*. Worm. Mus. p. 4. Charlt. de Foss. p. 218. N°. 8.

This earth is taken up in form of mud, from the lake of Mexico; they prepare it by burning, and then make it up into small cakes; it is of a snow white colour, remarkably light, and colours the hands greatly; it has the same effects in medicine as *cerufs*; is cold, dry, astringent, and alexipharmic; they also esteem it a remedy against poisons; the Mexican women use it to give a smoothness to their hands, and also to polish silver.

2. *Marga saxatilis Feroensis*. Worm. Mus. p. 5. Charlt. de Foss. p. 221. N°. 3. This is white, light, friable, and astringent.

3. *Marga saxatilis Norwegica*. Worm. Mus. p. 5. Charlt. de Foss. p. 221. N° 2. This kind Wormius received from the copper mines of Nidrosia in Norway; this is light, very fine and soft, but impure, and of a bright white colour, Wormius attributes to it the virtues of the white Samian earth.

4. *Terra Lemnia della Maiella in Abruzzo*. Boccone Mus. di Fisica e di Esper. Off. ix. p. 61. This kind is found in the craggy parts of the rocks of the mountain of Maiella, in the province of Abruzzo, in the kingdom of Naples; there are some grotto's, in which great quantities of this earth is found; it is also found at la Taranta, a village on the east side of the mountain, in a place called Grotta Arcangela, or del Cavallero, and also nigh la Valle del Inferno: It is a very white, light, dry, spongiuous, alkaline earth, and adheres to the tongue; the inhabitants esteem it greatly, and use it with success in bloody fluxes, and malignant fevers; they make a liniment of this earth, with olive oil, to cure inflammations in the throat; and externally use it for the drying of wounds and ulcers.

5. *Terra Lemnia di Mililli overo Stenomarga et Lac Lunæ*. Boccone Mus. di Fis. e di Esper. Off. 10 p. 63. This is found on the mountain Hybla, three miles distant from the territory of Mililli in Sicily; it is a very white earth, and somewhat ponderous; it is more particularly got in the fissures of the walls (which are of the solid rock) of a church, dedicated to St. Mauro, on that mountain. Boccone informs us not of its uses or virtues.

In some parts of Germany, when the common people first discovered this chalk, as it is sometimes found also on the surface of the earth, they superstitiously imagined it was a flour rained from heaven; they even went so far as to make bread of it, as it happened in Bohemia, and Misnia, in 1590, in Thuringia in 1597, and in Alsatia, and many other parts of Germany, in 1623; but they soon learnt, at the expence of many of their lives, the dangerous consequences of their superstition and ignorance.

VIII. *Creta arenacea Sicula, Terra di Baira dicta.*

Terra di Baira, Polvere del Chiaramonte, Elixir bezoar minerale Sicilianum. P. Boccone Mus. di Fis. e di Esper. Offerv. 7. p. 51. et Offerv. 12. p. 72. Ephem. Acad. Cæsar. Leopold. Nat. Curios. Cent. iii. et iv. Obs. 175. Valentini in suis Access. Noviss. præmissis Aurif. Med. Wolk. Siles. Subt. p. 276. Bruckm. Epist. Itin. Cent. iii. Ep. xi. p. 93.

This earth is sometimes found loose, or in powder, and then exactly resembles a fine white sand; sometimes concreted into masses, and resembles a sandstone of a fine grit or grain; it is harsh, rough, and dry, of a compact texture, and very weighty, it colours the hands greatly, does not melt freely in the mouth, is insipid to the taste, and very impure or gritty; in water, it raises a brisk ebullition, but diffuses very slowly, and thrown on live coals it burns in small azure flames like sulphur.

It suffers no change in the fire.

It is found in the Mountain di Cane, in the territory of Misilmeri, and in the territory of Baira near Palermo; in these places it is dug in large masses, like a sand stone; but round about the city of Monreale, it is found in powder

on

on the surface of the earth, lying in narrow irregular fents or cracks, caused by the summer heats.

Its uses in medicine are greatly celebrated in the Neapolitan and Papal territories, and it is distributed by several of the convents of those kingdoms. To prepare it for the use, they pound the masses, and expose the powder to the sun, to render it dryer, then having freed it from all its heterogeneous parts, they sprinkle it with brandy. The Jesuits of the Roman college distribute it at Palermo, after they have prepared it in like manner with brandy, and some other minerals, and give it the name of *Polvere del Fondacaro*.

Its other name of *Polvere del Chiaramonte*, it derived from its first inventor Claramontius, and who wrote a particular treatise on this earth.

It is used as a remedy against obstructions, pains and weaknesses of the stomach, cholicks, gravel, and melancholy; it is also found to be a good remedy in fevers: Boccone used it likewise in ulcerous and gangrenous sores, and found by experience that in such sores, whether infected by venom, or caused by acrid humours, it was a noble remedy; he also found this earth to be diaphoretic and diuretic.

SECT. III. *The Ash and Grey Chalks.*

M E M B. I.

Chalks which are not acted upon by acids.

I. *Creta cinerea.*

TRIPELA *cinerea*. Kundm. Prompt. p. 303. N^o. 141. Bruckm. Epist. Itin. Cent. iii. Ep. 10. p. 89. N^o. 12.

Terra Melia. Diosc. l. v. c. 180. Imperat. hist. Nat. l. iv. c. 17. et l. v. c. 21.

Tripela albo cinerea, ponderosa, durior, quæ Terra Melia Dioscoridis. Hill's hist. Foss. p. 68. N^o. 4.

This chalk is of a light ash colour, heavy and moderately hard, of a loose, open, and spongy texture, of a harsh dry and dusty surface, but does not colour the hands; it adheres slightly to the tongue, and breaks freely in the mouth; in water it raises a brisk ebullition, but does not immediately break into powder.

It never constitutes an entire stratum, but is found in the mines, in small masses, lodged in other strata.

It suffers no change in the fire.

Dioscorides ascribes to his *Terra Melia* the taste and virtues of alum, but in a remiss degree; he also found it to be detergent, and good in leprosy. This styptic taste ascribed to it, made Agricola, de Nat. Foss. l. v. place it in the class of aluminous fossils; however, tho' it is extremely probable this *Tripela* is the *Melia* of Dioscorides, yet I never could find any pieces of it, which had such a styptic taste.

It is found in many parts of Germany.

SECT.

SECT. IV. *The Red Chalks.*

MEMB. I.

*Chalks which are not acted upon by acids.*I. *Creta rubra.*

RUBRICA *fabrilis*. Diosc. l. v. c. 112. Pliny l. xxxv. c. 6. Galen l. ix. Simpl. et l. i. de Antid. Kentm. Nom. Foss. p. 8. N°. 2. Aldrov. Mus. Met. p. 257. Imperat. Hist. Nat. l. iv. c. 4. et. l. v. c. 19. Calceol. Mus. p. 134. Worm. Mus. p. 4. Merret's Pin. Rer. Nat. Brit. p. 218. Charlt. de Foss. p. 219. N°. 3. Kœnig. Regn. Min. Sect. iv. P. 3. c. iii. Kundm. Prompt. p. 302. N°. 127. Bayer Oryct. Norica, p. 15. Mercat. Met. Vat. p. 14. et p. 23. Ch. Helwigii diff. de Rubrica. Valent. Aurif. Med. p. 7. Dale's Pharm. p. 23. N°. 5.

Rubrica duriuscula; *the harder ruddle, red chalk*. Woodw. Meth. of Foss. p. 3. N°. 10. Cat. of Foss. l. a. 39. et. 40.

Marga ochracea rubra, Rubrica fabrilis vulgo. Linnæus's Syst. Nat. p. 204. N°. 2.

Ochra rubra cretacea, Rubrica, Rubrica fabrilis, Ochra rubra martialis. Wallerius's Mineralogy, Spec. 265. N°. 4.

Ochra argillacea indurata rubra, quæ Creta rubra authorum. Hill's hist. Foss. p. 62. N°. 12.

Terra cretacea rubra. Mus. Richt. p. 143.

A very hard and heavy chalk, of a deep red colour, of a dense, solid, compact, regular texture, of a smooth and somewhat unctuous surface; it colours the hands exceeding much, adheres firmly to the tongue, melts freely in the mouth, is astringent, and quite pure or free from grit; and difficultly breaks or moulders in water.

Burnt, it acquires a considerable hardness, and assumes a darker colour.

It is dug in most parts of Europe, as in Spain, in the island of Elba on the coasts of Tuscany, in Switzerland, in France, in Sweden, and in many parts of Germany; but the greatest quantity is brought us from Flanders.

Our English authors also affirm it to be found in Herefordshire, Lancashire, Rutlandshire, and Hampshire.

It is in great esteem among artificers of many kinds; it makes excellent crayons for the painters uses, but does not at all mix with oil, so as to be used in painting.

In England it has not hitherto been used in medicine, but in Germany it is held in esteem, and is greatly used in their practice, they reckon it as a kind of *terrene hæmatites*, and use it to the same purposes as the *hæmatites* in hæmorrhages, dysenteries, and other fluxes; Bayer highly extols it both for internal and external use, and informs us, that the celebrated powder of Dr. Lehman, physician to the Elector of Saxony, was chiefly made of the *Rubrica*.

Dioscorides

Dioscorides likewise informs us, it was reckoned to have the same virtues as the *Rubrica synopica*, but in a less degree.

The ancients got their *Rubrica* from Egypt, and other parts of Africa, and also from Spain.

SECT. V. *The Yellow Chalks.*

MEMB. I.

Chalks which are not acted upon by acids.

I. *Creta albo-flavescent.*

TRIPLELA. Woodw. Cat. I. a. 43. et 44. Dale's Pharm. p. 23. N°. 6. Bruckm. Epist. Itin. Cent. iii. Ep. 10. p. 89. N°. 8. 10. 13. 15, et 16. Mercat. Met. Vat. p. 20. Bayer's Oryctogr. Noricæ Suppl. p. 43.

Tripela albo-flavescent. Hill's hist. Foss. p. 67. N°. 2.

A light chalk, of a whitish yellow or very pale straw colour, moderately hard, of a firm regular texture; of a harsh dry surface, and colours the hands; it does not adhere to the tongue, breaks pretty freely in the mouth, and is slowly diffusible in water.

In the fire it acquires some hardness, and a pale rosy colour.

It is found in Poland, in Bohemia, and in other parts of Germany, but particularly near Nuremberg, at the village Holzengell, in the principality of Sonderhausen, and on Mount Blocksberg, also in the island of Corsica, and near Venice. This kind is also found, according to Smith's Nat. and Civ. hist. of the county of Cork, vol. ii. p. 383. at Arlow Moor, in the barony of Muskerry, in that county, and is vulgarly called by the inhabitants yellow free-stone.

It is used in cleaning metals, and by the lapidaries for polishing.

SECT. VI. *The Brown Chalks.*

MEMB. I.

Chalks which are not acted upon by acids.

I. *Creta fusca Terra cariosa dicta.*

TERRA cariosa, Rotten stone. Woodw. Meth. of Foss. p. 3. N°. 13. et Cat. of Foss. E. b. 9.

Tripela fusca levis. Hill's hist. Foss. p. 69. N°. 1.

This is a very light chalk, of an ashen brown colour, moderately hard, of a loose but regular texture, of a harsh, dry, and dusty surface, and colours the hands; it does not adhere to the tongue, breaks freely in the mouth, and in water soon falls into powder.

Burnt

Burnt, it acquires a deep ash colour, without any additional hardness.

It is chiefly got in Derbyshire, particularly on Bakewell moor, where it lies in detached pieces about a yard deep.

The *rotten stone* exhibited by Woodw. Cat. A. a. 32. and his *Terra natans* from New England, Cat. L. a. 27. are only varieties of this species.

Smith's Nat. and Civ. hist. of the county of Cork, vol. ii. p. 382. informs us, varieties of this species are found near the Blue bell in the barony of Barrymore, in Glanmire river, in considerable plenty; and in great plenty in the river Lee, near Cork.

It is greatly used by the braziers, and lapidaries.

TERRA NATANS. Woodw. Cat. A. a. 32. et 33. Dale's Pharm. p. 22. No. 6. Bruckman Epist. Jan. Cent. III. Ep. 12. p. 29. N. S. 10. 13. 14. 15. 16. Mercur. Med. V. 20. Huxley's Oryzology. Norton Suppl. p. 43. *Terra natans* Huxley's Hist. p. 67. No. 1. A light chalk, of a whitish yellow or very pale straw colour, and of a firm regular texture, of a harsh dry surface, and colour the hands; it does not adhere to the tongue, breaks freely in the mouth, and is slowly dissoluble in water. In the fire it acquires some hardness, and a pale red colour. It is found in Ireland, in Bohemia, and in other parts of Germany, particularly near Nuremberg, at the village Hohenberg, in the principality of Bontheim, and on Mount Blockberg, also in the island of Corsica, and near Venice. This kind is also found, according to Smith's Nat. and Civ. hist. of the county of Cork, vol. ii. p. 382. at Aulaw Moor, in the barony of Mallow, in that county, and is vulgarly called by the inhabitants yellow stone. It is used in cleaning metals, and by the lapidaries for polishing. **SECT. VI. The Brown Chalk.** *Terra natans* Huxley's Hist. p. 67. No. 1. This is a very light chalk, of an ashen brown colour, moderately hard, of a loose but regular texture, of a harsh dry, and dusty surface, and colour the hands; it does not adhere to the tongue, breaks freely in the mouth, and in powder falls into powder. **SERIES**

S E R I E S I.

C A P. II. G E N U S II.

O C H R E S.

Earths slightly coherent, ponderous, composed of fine particles, rough to the touch, and readily diffusible in water.

S E C T. I. *The Black OCHRES.*

M E M B. I.

Ochres which are not acted upon by acids.

I. *Ochra nigra argillacea.*

A *N Creta nigra mollis.* Kentm. Nom. Foss. p. 8. N°. 11?
Ochra nigricans argillacea. Worm. Mus. p. 17. Charlt. de Foss. p. 219. N°. 4.

Killoia molliuscula. *The softer killow.* Merret's Pin. Rer. Nat. Brit. p. 218. Woodw. Meth. of Foss. p. 2. N°. 5. et Cat. C. a. 26. et 27.

Humus nigra pictoria, Atramentum scissile. Wallerius's Mineralogy, species 4.

Argilla nigrescens friabilis levis. Hill's Hist. Foss. p. 34. N°. 1.

Lapis cæruleus anglicus, Killow dictus. Charlt. de Foss. p. 262.

Argilla nigra de Dietfurter-riet. Bruckm. Epist. Itin. Cent. ii. Ep. 94. p. 1197. N°. 26, et 27.

An Nigrum fossile Voigtsbergense. Mus. Richt. p. 143?

Terra mollis, tenuis, nigra. Bruckm. Epist. Itin. Cent. iii. Ep. 9. p. 82. N°. 76.

This ochre is of a fine black colour, with a bluish cast; when fresh dug it is greasy to the touch, and always retains a slight smoothness on its surface, it is very light, of a very loose friable texture, and colours the hands greatly, it adheres to the tongue, melts freely in the mouth, and has a disagreeable vitriolic taste, caused by the parts of that salt with which it is generally impregnated, and is impure, or leaves some grittiness between the teeth; in water it raises a great ebullition, and immediately breaks into a very fine powder.

In the fire it acquires some hardness, and burns to a grey colour.

It is found in great plenty on the side (near the top) of Cay Avon, a high hill near Dynasmondhwy, a village in Merionethshire, which place has long been famed for it, as is evident from an old British proverb; which says, it is one of the three remarkable things of that place. The rocks thereabouts

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also

also abound with a *vitriolic marcasite*. The inhabitants of that place, who call it *Nod du*, which in the Welsh language signifies a black mark, prepare it by beating it in a mortar, and wetting it, and then make it up into balls, and use it in marking the sheep.

Dr. Merret informs us, it is also found in Lancashire.

At Dietfurter-riet in the territory of Pappenheim, in Germany, the inhabitants prepare it by carefully washing away the gritty parts, and then make it up into sticks, or rolls like Indian ink, and it is in like manner used in painting.

Bruckman also mentions it to be found in Saxony, where it is called *Schiefer Schwartz*, and is greatly used in painting.

Wormius received his ochre from the silver mines in Norway; and Wallerius mentions it to be found near Huneberg, in the province of Westergyllen in Sweden.

Tournefort's Voyage to the Levant, Letter x. mentions a very fine black earth altogether insipid, found about Carlovassi in the island of Samos; which, says that author, as it serves to dye sowing-thread of a black colour, seems to partake of vitriol. The said earth is probably of this kind of ochre.

The English name of *colloz* or *killoz*, given to this ochre, according to Dr. Woodward is derived from its resemblance to the grime or smut on the back of chimneys, which is called *colloz* in the north of England.

II. *Humo-ochra, Creta nigra dicta.*

pnigites f. *Creta nigra*. Aldrov. Mus. Met. p. 259. Matth. p. 1392. Imperat. Hist. Nat. l. iv. c. 41. Worm. Mus. p. 5. Charlt. de Foss. p. 220. N°. 8. Kundm. Prompt. p. 302. N°. 135. Dale's Pharm. p. 20. N°. 5. Bruckm. Epist. Itin. Cent. ii. Ep. 95. p. 1208. N°. 25. et Cent. iii. Ep. 2. p. 16. N°. 9. et 11.

Terra nigra Randrusiensis. Worm. Mus. p. 5. Charlt. de Foss. p. 219. N°. 6.

Terra pnigitide nigræ simillima, quam cretam nigram vocant. Mercat. Met. Vat. p. 19. et 23.

Creta nigra, nigritis, melæna. Bruckm. Epist. Itin. Cent. iii. Ep. 2. p. 14.

Killoia duriuscula. The harder Killoz or marking stone. Woodw. Meth. of Foss. p. 3. N°. 12.

Terra atrii coloris. Woodw. Cat. L. a. 6.

Lapis cæruleus ducendis lineis idoneus. Merretti.

Pseudo-ochra levis nigrescens, quæ creta nigra pictorum. Hill's Hist. Foss. p. 66. N°. 2.

Fissilis mollior, friabilis, pictorius, nigrica. Creta nigra. Wallerius's Mineralogy, species 71.

This is a light hard earth, of a fine black colour, of a close firm regular texture, and has a slight flakey appearance; of a dry dusty surface, and colours the hands; it adheres firmly to the tongue, melts difficultly in the mouth, has a slight vitriolic taste, and is a little impure; in water it raises an ebullition, but very difficultly breaks in it.

When

When put into the fire it readily ignites, but does not continue burning, and becomes a fine white, and very soft substance, exactly like wood ashes.

This calcined matter yields, says Hill, a small quantity of an alkaline salt, and the experiments shew the substance itself to be partly of vegetable, partly of fossil origin.

Wallerius reckons this earth to be no other, than a destroyed slate.

It is found in many parts of Germany, at (Steinach in the duchy of Coburg, in Saxony; it is dug in masses of six pounds weight or more,) in Switzerland and Italy, particularly about the city of Milan.

It is greatly used in painting.

The *Creta fuliginei coloris* of Worm. Mus. p. 5. is probably referable to this species of ochre.

SECT. I. MEMB. II.

Alcaline Ochres.

III. *Ochra nigra alcalina.*

THIS is a very heavy ochre, of a fine black colour, moderately hard, of a compact regular texture, of a harsh, dry, and dusty surface, and colours the hands very much; it adheres slightly to the tongue, melts freely in the mouth, has no remarkable taste, and is somewhat impure; thrown into water, it raises a strong ebullition, and immediately breaks into a very fine powder.

It raises a violent effervescence with aqua-fortis.

It remains a great while unchanged in the fire, but at last burns to a pale red colour, with no additional hardness.

I received this ochre from the slate quarries near Oberhassel in Switzerland.

SECT. II. *The Red Ochres.*

MEMB. I.

Ochres which are not acted upon by acids.

I. *Ochra dura ponderosa rubra.*

THIS is a very heavy and hard ochreous iron ore, of a fine deep red colour, of a firm compact solid texture, of a harsh, dry, and very dusty surface, and greatly colours the hands; it very slightly adheres to the tongue, melts slowly in the mouth, and is very impure; it raises an ebullition, but very difficultly breaks or moulders in water.

Burnt, it suffers no change.

It is dug in Warwickshire, and is much used in painting.

II. *Ochra friabilis ponderosa rubra.*

Ochra rubra friabilis ponderosa, fil syricum antiquorum. Hill's hist. Foss. p. 57. N^o. 1.

This is of a fine strong red colour, very weighty, of a loose friable texture, and of a very rough and dusty surface; it colours the hands greatly, adheres firmly to the tongue, melts freely in the mouth, has a strong astringent taste, and is very impure or full of grittiness; in water it raises a great ebullition, and immediately moulders into a fine soft powder.

In the fire it acquires a considerable hardness, and a much paler colour.

It is dug in many parts of England, and is much used in painting.

III. *Ochra Indica saxea purpureo-rubra.*

Stone colour from the East Indies. Woodw. Cat. I. a. 38.

Ochra saxea rubra, quæ fil marmorosum antiquorum. Hill's Hist. Foss. p. 62. N^o. 13.

This is a heavy and very dry hard stoney ochre, of a fine purplish red colour, of a very compact and solid texture, and quite like a metallic ore; its surface is rough and dusty, and it colours the hands; it adheres firmly to the tongue, melts with extreme difficulty in the mouth, and breaks or moulders as difficultly in water.

The pieces of this ochre generally have small cavities, in which I have frequently observed pieces of potters lead ore, and also pieces of a bright dazzling mock ore.

It suffers little change in the fire, the colour rather becoming more dusky.

It is brought to us from the East Indies: there are several considerable strata of it, says Hill, on the borders of China.

It is of great use among the painters, it being a very valuable colour, and by them is called the Indian stone red.

IV. *Ochra levis purpurascens.*

Ochra purissima levis purpurascens. Hill's Hist. Foss. p. 60. N^o. 8.

This is of a very fine purple colour, light and friable, of an even and regular texture, of a dusty surface, and colours the hands; it adheres firmly to the tongue, melts freely in the mouth, is quite pure, and of a strong astringent taste; in water it raises a slight ebullition, but does not readily moulder away.

It suffers little change in the fire.

It is common in the perpendicular and horizontal fissures, where there is iron ore, especially in the forest of Dean, in Gloucestershire.

The earths exhibited by Woodward, Cat. c. a. 7, 8, and 9. ("red loose earths, very fine; found in an iron mine in the forest of Dean. This sort is
" found

“ found generally near the ore, in the inclining fissures: the workmen save it, and call it red ochre,”) are of this species.

The said author likewise exhibits, Cat. A. a. 90, et 91. earth, very fine, and of a bright red, preferable to that brought from the East Indies for the use of painters, found in a fissure, among iron ore, in the Skrees, a mountain in Cumberland; 'tis a red ochre: and red ochre from Staffordshire, which both are probably of this very species of ochre.

SECT. II. MEMB. II.

Alcaline ochres.

V. *Ochra fusco-rubra, quæ rubrica Sinopica antiquorum.*

RUBRICA *sinopica* s. *Sinopis pontica*. Hill's Theophr. p. 126. Diosc. l. v. c. 111. Pliny Hist. Nat. l. xxxv. c. 6. Avicen. l. xi. tract. 2. c. 428. Matth. p. 1359. Salmasius's Exercit. Plin. Imperat. Hist. Nat. l. iv. c. 3. et 4. et l. v. c. 19. Tournefort's Voyage to the Levant, vol. ii. Letter v. Dale's Pharm. p. 19. N°. 6. Mercat. Met. Vat. p. 13. et p. 23.

Ochra purpurea purissima ponderosa, quæ rubrica sinopica antiquorum. Hill's Hist. Foss. p. 60. N°. 9.

This is a fine pure earth, quite free from any grittiness, of a brownish red or liver colour, very weighty, but not very hard, of a dense compact texture, of a dusty surface, and colours the hands; it adheres firmly to the tongue, melts slowly in the mouth, is astringent to the taste, and when thrown into water, spreads and diffuses itself greatly.

In the fire it acquires a great hardness, but does not change colour.

It was anciently found in Cappadocia, and was constantly carried to Sinope for sale, from whence it obtained its name *Sinopis*: it was also found in Egypt, and in the Baleares islands, which are at present called Majorca and Minorca. Strabo likewise says, as good *rubrica* as the *sinopic*, was brought from Turditania, which is now the kingdom of Algarve in Portugal, and that that of Spain, which very likely is the *almagra*, hereafter to be described, was as good.

Imperatus and Mercator affirm this ochre to have been brought into Italy, in their times, from Constantinople, in some quantity, and that it was called, tho' erroneously, *Bolus armenus orientalis*.

Mercator informs us, he found three kinds of *rubricæ* in the iron mines of the island of Elba, on the coasts of Tuscany, in the veins of the iron ore, and also lodged in the horizontal fissures: the first sort was the true *rubrica sinopica*, of a liver colour; the second sort was not of so fine or strong a colour; and the third sort was the *rubrica fabrilis*, or common *rubrica*.

Hill says, that he has received it from the New Jerseys in America, where it is frequently found in digging at about fifteen or twenty feet deep, and is vulgarly called blood-stone.

It was anciently used in medicine, and held in great esteem as an astringent in fluxes and hæmorrhages of all kinds.

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It was likewise held in great esteem for painting, and was one of the four primitive colours, viz. the red, of the great painters of antiquity.

VI. *Ochra Hispanica almagra dicta.*

Ochra purpurea friabilis alcalina, almagra recentiorum, sil atticum antiquorum. Hill's hist. Foss. p. 57. N°. 2.

This is of a fine deep red colour, with a cast of purple, weighty, not hard, but easily crumbles between the fingers, of a moderately dense, compact, and regular texture; harsh and rough to the touch, of an extremely dusty surface, and colours the hands very much; it adheres firmly to the tongue, melts freely in the mouth, is astringent to the taste, and very impure; in water it raises a great ebullition, and immediately breaks into a very fine powder.

Burnt, it acquires a paler colour, and a considerable hardness.

It is dug in great quantities in many parts of Spain, chiefly in the kingdom of Murcia; particularly at the foot of the mountain of Almasaron, a town in that kingdom; the Spaniards call it *Almagra*, which word in the Arabick language signifies *red*.

It is greatly used in painting, and is to be found in the colour-shops of this metropolis, by the name of *Spanish brown*.

VII. *Ochra elegantissimè rubescens.*

Ochra friabilis levis pallide rubescens alkalina. Hill's hist. Foss. p. 59. N°. 6.

This ochre is of a fine bright red colour, light, easily friable, of a loose texture, of a rough dusty surface, and colours the hands greatly; it adheres firmly to the tongue, does not melt very freely in the mouth, is of a sub-astringent taste, and very impure, and breaks or moulders very difficultly in water.

It acquires no hardness in the fire, and burns to a duller colour.

This ochre I received from Dr. Hill, and have never seen it elsewhere; he informed me, that it was found in Florida, at about forty feet depth, in digging after an imaginary gold mine: the Doctor also surmises, it may probably be found in many other parts of America.

It is a valuable colour, and deserves being carefully sought after.

VIII. *Ochra purpurea Persica.*

Ochra purpurea ponderosissima dura. Hill's Hist. Foss. p. 58. N°. 3.

Woodw. Cat. l. a. 36, et 37. Pomet des Drogues, p. 115. Valentin. Aurifod. Med. p. 7. Bruckm. Epist. Itin. Cent. iii. Ep. 9. p. 80. N°. 40.

This is of a fine purple colour, extremely heavy, and of a very great hardness; of a firm compact solid texture, and always full of bright glittering particles, of a rough and dusty surface, and colours the hands very much; it adheres

heres very firmly to the tongue, melts difficultly in the mouth, and is of a rough austere and very astringent taste; thrown into water, it makes a very considerable ebullition, but moulders or breaks very difficultly in it.

In the fire it burns to a greater hardness, with very little change of colour.

This earth is got in great quantities, in the island of Ormuz, in the Persian gulph, and is carried thence to Surat, Bengal, and other parts of India; where it is used in painting of houses, ships, &c.

It is greatly used in painting, and is called the *Indian red*.

IX. *Ochra rubra Bolus Veneta dicta.*

Ochra friabilis pallide rubescens, quæ Bolus Veneta vulgo. Hill's Hist. Foss. p. 59. N^o. 5.

The true Venetian bole. Woodw. Cat. I. *w 9.

This is of a dull red colour, moderately heavy, of a pretty firm even texture, and easily crumbles between the fingers, of a dusty surface, and colours the hands; it adheres firmly to the tongue, melts freely in the mouth, is slightly astringent to the taste, and is very impure; in water it immediately breaks into a fine powder.

Burnt, it acquires a duskier colour, and a considerable hardness.

It is brought from Venice, and is a colour greatly esteemed among painters.

Hill errs in saying this ochre makes no effervescence with aqua-fortis, for it effervesces very considerably with that acid.

X. *Ochra purpureo-rubra.*

This is a very valuable and elegant ochre, of a fine deep purplish red colour, of a firm compact regular texture, easily crumbling between the fingers, moderately heavy, of a rough, harsh, dusty surface, and colours the hands greatly; it adheres firmly to the tongue, melts slowly in the mouth, is somewhat impure, and moulders or breaks difficultly in water.

It burns to a considerable hardness, with very little change of colour.

It is sometimes found, but in small quantities, in loose powder, and also concreted into small lumps, in some clay pits at Theale, four miles from Reading in Berkshire.

It is a very fine ochre for the painters use, and deserves carefully to be sought after.

XI. *Ochra sordide rubra.*

This is of a deep dull brown red colour, very weighty and hard, of a firm, compact, solid, regular texture, of a harsh, rough, and dusty surface, and greatly colours the hands; it does not adhere to the tongue, melts slowly in the mouth, is very astringent to the taste, and pure; in water it slowly breaks into a fine powder.

Burnt, it acquires a great hardness, and a very dull purplish red colour. It is dug in Yorkshire, and is there called *reddle*.

XII. *Ochra rubra ponderosissima.*

This is of a very deep brown-red colour, extremely heavy, of a compact firm regular texture, but is easily broken between the fingers; of a very rough, dusty surface, and colours the hands very much; it adheres slightly to the tongue, melts freely in the mouth, is of a strong astringent taste, and a little impure; in water it immediately breaks into a fine powder.

It suffers very little alteration in the fire.

It is dug in several parts of this kingdom, and is greatly used by painters.

XIII. *Ochra rufa.*

Rust-coloured terra lapidosa. Plot's Nat. Hist. Oxfordsh. Ch. iii. § 51. p. 67. Lister de Fontib. Med. Angl. p. 26.

This ochre is most generally found in powder; it is harsh, of a rust colour, and colours the hands greatly; it is moderately heavy, impure, and insipid to the taste.

When found concreted into lumps, it is of a loose friable texture; slightly adheres to the tongue, melts difficultly in the mouth, and breaks very difficultly in water.

In the fire it burns to a fine brown red colour.

It is not as yet used in painting, but I am persuaded it would prove a good colour, and quantities of it might be easily procured.

It is found very frequently pitched in round cavities in the solid chalk strata in the chalk pits of Surry, Kent, Buckinghamshire, and Oxfordshire; the chalk diggers have a very just and philosophical notion of the origin of this ochre, which they call iron moulds, and affirm it to proceed from the dissolution, or decomposition of the *irony vitriolic pyrites*, which they also vulgarly call iron moulds; and which so greatly abound in the chalk. I have often with great pleasure observed these ochreous masses, of a striated texture, while yet lodged in the chalk, exactly like the texture of that *pyrites*, also *pyrites* half decomposed, the other half being yet solid *pyrites*; and *pyrites* which were mere crusts, quite filled with this kind of ochre.

I have likewise received it from a lime-stone quarry near Bath, where it is found in small veins and patches in the fissures of the quarry.

The yellow earth from Ystimatean mines, in Cardiganshire, exhibited by Woodward, Cat. C. a. 4. and which, the Doctor says, was found hanging down in form of *stalactites*, from the top of an anciently worked lead vein there (there were more at the top, and on the sides of this work,) is this species of ochre: as is likewise his brown earth, Ibid. a. 5. To this very species is also to be referred, his specimen a. 6. *ibid.* which he says, is commonly found incrustated on sticks, rushes, &c. in vast quantities, in the coal work of Billymill-Moore-level, in Northumberland, and, Cat. E. a. 1. from Rose Park,

Park in Cumberland; the Doctor further adds, that the like ochre is frequently observed in the adits of coal pits, in Cumberland, Northumberland, and Yorkshire.

The ochreous earths likewise exhibited by the said author, Cat. E. a. 2. et a. 13. from chalk-pits in Kent, and Buckinghamshire, are of this very species.

Leopold, in Itin. Suecico, p. 70. exhibits a *Terra martialis ruffa, vel cinamomo in pulverem redacta similis*, which is dug at the village Skeden, in the parish of Multrad, in the province of Angermannia in Sweden, which probably is of this species.

SECT. III. *The Yellow Ochres.*

MEMB. I.

Ochres which are not acted upon by acids.

I. *Ochra argillacea flava.*

OCHRA *ponderosa dura pallide flavesceus*. Hill's Hist. Foss. p. 51. N^o. 2.
A clayey ochre, of a very fine deep yellow colour, heavy, very hard, of a close compact firm texture, of a smooth surface, without the least roughness or dustiness, and does not colour the hands; it adheres firmly to the tongue, melts slowly in the mouth, is pure, or free from grittiness, and difficultly moulders or breaks in water.

Burnt, it acquires a fine deep colour, without any hardness.

It is dug on Mendip hills in Somersetshire, and is much used in painting, it proving a fine colour.

II. *Ochra friabilis pallide flavesceus.*

This ochre is very fine, of a pale but very agreeable yellow colour, moderately heavy, of a very loose friable texture, of a dusty even surface, and colours the hands greatly; it does not adhere to the tongue, melts freely in the mouth, is of an astringent taste, and somewhat impure; in water it immediately breaks into a fine powder.

In the fire it acquires no hardness, and burns to a fine rose colour.

It is dug in many places in Saxony, and is greatly esteemed by the German painters.

III. *Ochra Italica lutea.*

Of a fine yellow colour, of a firm compact regular texture, is easily broken between the fingers, and is very light; its surface is very dusty, and colours the hands; it does not adhere to the tongue, melts slowly in the mouth, has

an astringent taste, and is impure; and breaks or moulders difficultly in water.

Burnt, it acquires a considerable hardness, and a dull red colour.

It is dug in several parts of Italy, and is much used by the painters of that country.

IV. *Ochra ponderosa pulchre flava.*

This is a coarse ochre, of a fine bright yellow colour, heavy, hard, of a firm, compact, and very irregular texture; of a harsh, rough, dusty surface, and colours the hands; it does not adhere to the tongue, melts freely in the mouth, and is extremely impure; in water it immediately falls into powder.

In the fire it acquires no hardness, and burns to a very pale ashen red colour.

This kind is dug on Mendip hills in Somersetshire, and is greatly used by the painters.

V. *Ochra pallide lutea.*

A very fine ochre, of a very pale yellowish colour, of an even and regular texture; it is moderately heavy, and very easily crumbles or breaks between the fingers; its surface is dusty, and colours the hands; it adheres to the tongue, melts freely in the mouth, is very impure, and it slowly breaks in water.

Burnt, it acquires a considerable hardness, and a fine strong pink colour.

This ochre is found in a limestone quarry at Steery Way, near Wellington in Shropshire; the stratum of it is about one foot thick, and lies above the stone, about four yards below the surface.

VI. *Ochra lutea.*

This is of a fine high yellow colour, light, friable, of a loose regular texture, of a dusty surface, and colours the hands; it adheres to the tongue, melts freely in the mouth, and is quite pure, or free from grittiness; in water it immediately breaks into a fine powder.

Burnt, it acquires some hardness, and a fine bright red colour.

This ochre is sometimes found in the Derbyshire and Flintshire lead mines.

VII. *Ochra crocei coloris.*

Ochra crocea laminata levis, quæ ochra Attica Dioscoridis. Hill's Hist. Foss. p. 35. N^o. 5.

This ochre is of a fine deep but bright yellow, like that which saffron gives to water, and sometimes is found slightly spotted with red. It is remarkably light, of a soft shattery friable texture, and generally of a laminated structure; its

its surface is rough and dusty, and it colours the hands, it adheres to the tongue, melts freely in the mouth, and is quite pure; in water it raises a great ebullition, but does not readily moulder away in it.

Burnt, it acquires a dusky red colour, without any hardness.

This ochre is found sometimes constituting a stratum of itself, at other times lodged in perpendicular fissures, and at other times concreted into loose nodules, and lodged in other strata.

It is found in several parts of this kingdom, as in Northamptonshire, Staffordshire, and about London.

Kentm. Nom. Foss. p. 8. N^o. 3. exhibits an *Ochra nativa crocei coloris Vratislaviensis*, Mercat. Met. Vat. p. 23. an *Ochra nativa crocei coloris ex agro Balneoregiensi*; and Bayer Oryctogr. Norica, p. 14. and Bruckm. Epist. Itin. Cent. iii. Ep. 4. p. 26. N^o. 9. exhibit a fine lemon coloured ochre, which burns red, found in great plenty near Petzensteiner Hüll, a village in the territories of the city of Nuremberg; and which is carried from thence in great quantities to various parts of Germany; all which ochres are probably of this very species.

VIII. *Ochra aurei coloris.*

Ochra levis aurea friabilis, quæ ochra Theophrasti. Hill's Hist. Foss. p. 52. N^o. 4. and his Theophr. p. 125.

This is of a very fine and strong, tho' not deep yellow colour, light, of a loose friable texture, of a harsh, dusty, surface, and colours the hands; it adheres firmly to the tongue, melts freely in the mouth, is quite pure, and in water does not readily break or fall into powder.

In the fire, it burns to a very elegant red colour, with a little additional hardness.

This ochre is chiefly found in loose nodules in other strata, and sometimes also in the perpendicular fissures of mines.

It is found in several parts of this kingdom; Hill says, on Mendip hills it is common in the fissures of the mines there, and that it is likewise found in a gravel pit on the right hand side of the Oxford road, about a mile from London, where there is always great plenty of it, in lumps of four, five, or six ounces weight, and also contained in the ferruginous crustated geodes's, which abound in that pit.

The specimen exhibited by Dr. Woodward, Cat. C. a. 3. is this very species of ochre, and which he notes, is commonly found in the fissures of the iron mines, in the forest of Dean, near the ore.

An *Ochra aurei coloris*, is exhibited in the Mus. Richt. p. 143. but as that author gives no description of it, it remains doubtful whether it is of this species or not.

Hill further says, he has observed this ochre in some places hanging to the sides, and from the tops of old mines, or other cavities, something resembling rude *Stalactitæ*, and also not unfrequently in masses of three or four ounces weight, in beds of chalk: in this latter assertion he is very erroneous; for I am convinced he never found this ochre in any chalk stratum; what I imagine he means, is, the rust coloured ochre, or *Ochra rufa*, already

described,

described, and which is found in quantities in the chalk pits of Surry, Kent, Buckinghamshire, and Oxfordshire; but that ochre is so greatly alkaline, as to raise a violent effervescence with acids, whereas this species is not at all acted on by them; which added to the different appearances, and other qualities of these two ochres, must certainly determine any judicious naturalist, to allow them to be two very different species.

S E C T. III. M E M B. II.

*Alcaline Ochres.*IX. *Ochra rufo-flava.*

OCHRA *Anglica.* Worm. Mus. p. 17. Merret's Pin. Rer. Nat. Brit. p. 218. Charlt. de Foss. p. 219. N°. 5. Woodw. Cat. A. a. 76, et 77. and Cat. L. a. 21. Bruckm. Epist. Itin. Cent. iii. Ep. 3. p. 24.

Ochra Romana. Woodw. Cat. I. a. 29.

An Ochra stanni fulva Anglica. Linnæus's Syst. Nat. p. 205. N°. 6?

Ochra ponderosa flava friabilis. Hill's Hist. Foss. p. 54. N°. 6.

This is a hard heavy ochre, of a very deep or brown yellow colour, of a firm, compact, regular texture; of a harsh, rough, dusty surface, and colours the hands greatly; it adheres to the tongue, melts freely in the mouth, and is impure; in water it immediately breaks into a fine powder.

In the fire, it acquires a little hardness, and a dusky purplish red colour.

It is dug in Somersetshire near Bristol, and also in Monmouthshire, where it is made up into large balls, and great quantities of it are yearly exported to foreign parts.

Dr. Woodward found this ochre in a lead mine in Arkendale, in Yorkshire, also in a coal pit near Cockermouth, in Cumberland, where it was deposited in cavities at the bottom of the adit, over which the water passed. It is common, says the Doctor, in the adits of many of the coal pits in the North, and I take it to be the ochreous part of the coal drained out by the water.

The said Gentleman exhibits this same kind from near Rome, where it is got in great quantities; and he also received it from New England.

The *Ochra Islandica* of Worm. p. 17. Charlt. de Foss. p. 219. N°. 5. and Bruckm. Epist. Itin. Cent. iii. Ep. 4. p. 24. by Wormius's description, seems to be this species of ochre.

Bruckm. Epist. Itin. Cent. iii. Ep. 4. p. 26. N°. 11. exhibits an *Ochra obscure flava*, which, with many other kinds of ochres, are dug in the Rammelsberg mountain, near Goslar; and are also found deposited by the waters in the adits of the mines there. These ochres, says that author, are washed and prepared for use by the miners of that place; and are esteemed next to the English ochre. Kentm. Nom. Foss. p. 8. N°. 1. and Behrens Hercynia Curiosa, also make mention of them. Probably their *Ochra obscure flava*, is of this very species.

SECT. IV. *The Brown Ochres.*

MEMB. I.

Ochres which are not acted upon by acids.

I. *Ochra fusca Terra Umbria dicta.*

TERRA *f. Creta Umbria.* Imperat. Hist. Nat. l. iv. c. 5. et 44. Worm. Mus. p. 4. Charlt. de Foss. p. 219. N°. 7. Woodw. Meth. of Foss. p. 4. N°. 18. et Cat. l. a. 25. et 26. Valent. Aurifod. Met. p. 6. Kundm. Prompt. p. 302. N°. 124. Bruckm. Epist. Itin. Cent. iii. Ep. 5.

Ochra pallide fusca levis, quæ Umbria pictorum. Hill's Hist. Foss. p. 63. N°. 1.

Alana gleba. Mercat. Met. Vat. p. 14. et 23.

Terra subfusci coloris, quæ a pictoribus vocatur Terra d'Ombra. Mercat. Met. Vat. p. 23.

Umbra Anglica colore subfusco. Mus. Richt. p. 143.

Humus nigro-brunea, Umbra auctorum, Creta Umbria. Wallerius's Mineralogy, species 3.

This is a very light ochre, of a fine pale brown colour, of a close, compact, and regular texture, and breaks easily between the fingers; of a dry, even, and slight dusty surface, and colours the hands a little; it adheres firmly to the tongue, melts slowly in the mouth, has an astringent taste, is very pure, or quite free from any grittiness, and slowly breaks or moulders in water.

Burnt, it becomes of a deep reddish brown colour, but acquires no hardness.

This ochre was anciently found in the greatest plenty in Umbria, now the dukedom of Spoleto, in the Papal territories, from whence it originally derived its name, and it yet continues to be brought us thence.

Umbre is now chiefly dug in the Turkish dominions. In Cyprus it is found in great quantities.

It is likewise found in many parts of Germany, as at Annaberg, Scheibenberg, and Schwartzenberg in Saxony, near Steinach in the duchy of Coburg, in the duchy of Blackenburg, and also near the mines of Sahlberg in Sweden.

In this kingdom it is sometimes found, tho' very rarely, in the veins of lead ore. I have met with it in the lead mines of the Peak in Derbyshire, in small lumps, lodged with the deep brown ochre, next to be described. I have likewise received it from the lead mines in Flintshire; and Hill affirms, he has collected it on Mendip hills in Somersetshire.

It is greatly used and esteemed by the painters.

Imperatus imagines this ochre to have been the *Achaian sil* of the ancients.

Mercator and the Mus. Richt. make it the *Alana gleba* of the ancients. Those authors, especially the former, say, that tho' the accounts of the *Alana*

gleba

gleba of the ancients are very obscure, and only P. Ægineta informs us it had the virtues of the *Armenian bole*, yet as we find this species of ochre among the Vallachians, which were the Alani of former times, and that those people use it in pestilential and other fevers (the effects of which, says he, I have also tried with success) I conclude this ochre probably to be the said *Alana gleba* of the ancients.

Wallerius ranks the *Umbre* as a *humus* or mould, but I think erroneously; that author imagines, that by its immediately flaming in the fire, and by the smell which it then sends forth, that it owes its colour to an admixture of bituminous parts.

II. *Ochra friabilis nigro-fusca.*

Woodw. Cat. A. a. 65, 67, 68, et 69. et Cat. C. a. 2. et 25.

An Umbra Anglica fusci coloris, Mus. Richt. p. 143?

A very light, friable, and exceeding fine ochre, and consists of parts extremely small, subtile, and even impalpable; of a loose regular texture, and of a very deep blackish or dark brown colour; it is often variously blended with veins of a yellow ochre, and thick set with glittering sparry particles. Its surface is even, tho' very dusty, and it colours the hands greatly; it adheres firmly to the tongue, melts pretty freely in the mouth, and raises a pretty strong ebullition in water, but does not readily break into powder.

In the fire it acquires a great hardness, and a deep blueish black colour.

I have observed this ochre in some quantity, in the veins of lead ore, in the Peak in Derbyshire, especially at Portaway lead mine, near Winster, where the miners vulgarly call it *black wadd*; I have likewise received it from the lead mines in Flintshire, and Dr. Woodward found it plentifully in a vein of lead ore at Totter Gill, Intacks Nook, in Arkendale in Yorkshire; the Doctor likewise collected it in a fissure of a mountain near the Skrees, and in large masses upon the top of another mountain in Cumberland, also in a lead vein, at the top, near the surface, in one of the Companies mines, called Bwlch Kaninog, in Cardiganshire, and in a sinus of a rocky cliff, betwixt Tenby and Milford in Wales.

It is not as yet known to the painters, but is greatly worth their attention; I have had it tried both in water and oil, in both which it makes a very fine colour.

This earth, by some experiments made on it, is found to be very inflammable, when prepared in a particular manner; I cannot say the experiment succeeded with me, but as it succeeded with several curious gentlemen of great veracity, I cannot omit giving it a place in my history; the first discovery of the inflammable property of this earth, was made by a Derbyshire gentleman, greatly esteemed for his knowledge, who published it in the Gentleman's magazine, for 1751, p. 70. and for February, 1752, p. 82. The account is as follows, "Having powdered and mixed this ochre with linseed oil, in order to
"grind for paint, I left it in a heap, and returning in about three quarters of
"an hour, found it rolling about in a gentle flame; the smoak and smell
"made it impossible to endure being near it. A second time I mixed about
"the same quantity, i. e. one pound and a half, to try if it would operate as
"before;

“before; it lay three quarters of an hour, and it felt quite cold; but a smoak
 “ascending from a lump the bigness of a pea, I broke it, and in half an mi-
 “nute the whole was on fire, it did not flame till stirred, and then burnt with
 “violence till the oil was consumed.”

By other experiments made at London, this earth, being lightly mixed with linseed oil, kindled in a little more than an hour and a half. It did not flame, but burnt with intense heat for more than three hours, till all the oil was consumed, and then it remained to appearance hardly diminished in weight, or otherwise altered in form or colour: when stirred, it emitted a quick kind of luminous vapour like bruised gunpowder. Upon mixing of it a second time, it fired again, tho’ after much longer trying; but on trying it a third time, it did not fire.

This earth, says the author, was got in a lead mine in the Peak of Derbyshire, about ten fathom below the earth’s surface; it is there further said, that it lies very deep in the earth, and that there are strata of it, from one inch, to ten or twelve inches thick, especially at Parwick, which is four miles north west from Ashborn, and at Elton, which is eight miles north west from Ashborn; that it is used in Derbyshire as paint, particularly to mix with other colours, to make them dry (where the colour will admit of such a mixture) as chocolate colour, mahogany colour, or other colours for priming, &c.

SECT. V. *The Blue Ochres.*

MEMB. I.

Alcaline Ochres.

I. *Ochra friabilis cœrulea.*

THIS is quite a pure earthy ochre, of a fine pale blue or sky colour, of an even, regular, and compact texture, friable, or easily broken, and light, of a slight dusty surface, and colours the hands; it adheres to the tongue, melts readily in the mouth, has a disagreeable taste, and is pure; and very slowly breaks or moulders in water.

This ochre is found in very small roundish lumps, of the size of turnip seeds, mixed with a very dusky green coloured, loose, harsh, earth.

In the fire it acquires a dark brown colour.

That great naturalist, the late Sir Hans Sloane, Baronet, who presented me with this earth, informed me, he had received it by the name of *blue earth from Ireland*.

It would prove a fine and valuable colour in painting, could it be procured in any quantity.

I do not find any author mentions this species of blue ochre: indeed Kentm. Nom. Foss. p. 16, et 17. exhibits the following kinds, which very probably are of this species, viz. 1. *Cœruleum pulcherrimum ultramarinum seu Cyprium in terra cinerea, simile cœruleo factitio optimo*; 2. *Cœruleum nativum insign. glebosum Schneebergense, intus concavum, quod ex terra candida sabulosa effoditur*; and 3. *Cœruleum*

leum nativum copiose adhærens terræ duræ cinereæ tenui; and Plot's Nat. Hist. Oxfordsh. p. 57. exhibits a kind like Kentman's second sort; he calls it a sort of *cæruleum* or *native blue*, found in very good plenty in marl at Blund's Court, coating the small cavities of the earth. Wallerius also exhibits a variety of the *Oebra cupri cærulea* or *Lapis Armenus*, which he synonyms *Cæruleum montanum terreum*, and describes it to be earthy, and not of a very compact or close texture, which perhaps may also belong to this species.

I cannot here omit taking notice of a very extraordinary earth, mentioned by Kentm. (an author of credit) Ibid. p. 1. N°. 9. and p. 16. N°. 3. he calls it *Cæruleum Patavinum* or *Paduan blue*, and says the clods of this earth are found in the fields, and when broken, contain in them an exceeding fine friable white earth, which in a short time turns blue, only by being exposed to the air. Imperatus Nat. Hist. l. v. c. 44. likewise mentions this Paduan earth from Centomani; and tho' he says it is not known to him, yet he gives credit to the account.

II. *Oebra cærulea Lapis Armenus dicta.*

Lapis Armenus. Hill's Theophr. p. 100. Diosc. l. v. c. 65, et 66. Plin. Hist. Nat. l. xxxv. c. 6. Galen. l. ix. Simpl. Avicenna l. ii. tract. 2. c. 418. Mesues l. ii. de Simpl. Med. Purgan. c. 13. Agricola de Nat. Foss. l. iii. c. 19, 20, et 21. Aldrov. Mus. Met. p. 351. Cæsalp. p. 163. Calceol. Mus. p. 468. Schwenckf. Cat. Foss. Siles. p. 366. Imperat. Hist. Nat. l. iv. c. 6. et 23. Boet, de Boot, p. 293. Worm. Mus. p. 66. Grew's Mus. Reg. Soc. p. 316. Baufchii Sched. de Cæruleo, &c. Woodw. Meth. Foss. p. 3. N°. 9. et. Cat. A. a. 51, et 52. et l. 26, 27, 28, et 29. Valent. Aurifod. Med. p. 42. Dale's Pharm. p. 45. N°. 2. Mercat. Met. Vat. p. 71, et 75. Mus. Richt. p. 216.

Azutum s. *Cæruleum fossile.* Merret's Pin. Rer. Nat. Brit. p. 218.

Oebra cupri cærulea, Bergblau. Linnæus's Syst. Nat. p. 205. N°. 3.

Cæruleum montanum, Bergblau. Cramer's Ars docim. § 366.

Cuprum solutum vel corrosus, præcipitatum cæruleum, Cæruleum montanum, Oebra cupri cærulea, Chrysocola nonnullorum authorum. Wallerius's Mineral. Spec. 270.

Oebra cærulea friabilis, quæ Lapis Armenus. Azuthum. Hill's Hist. Foss. p. 64. N°. 1.

This is of an elegant bright or clear blue colour, sometimes of a deeper, sometimes of a paler blue, and also sometimes with a greenish cast, generally of a loose porous texture; tho' it is also met with, but rarely, of a firm, compact, and regular texture; it is always of a stoney consistence, yet not hard, but breaks very easily between the fingers, and is as easily scraped with a knife; generally very light, of a pretty even and not dusty surface, nor does it colour the hands; it adheres slightly to the tongue, melts slowly in the mouth, is of a disagreeable taste, and difficultly breaks or moulders in water.

Burnt, it loses all its colour, becomes friable, and has a metallic slag-like appearance.

This kind is always found in and near copper mines, in most parts of the world. Authors recount its being found in most countries of Europe, in Italy, Hungary, Transylvania, Poland, Thuringia, Saxony, Bohemia, Silesia, and Spain.

In

In England we find it also in our copper mines; Dr. Woodward collected it on Wenskill hill, near Settle, as also at Malham in Yorkshire, (from whence I have likewise received it) in Cheshire, and in Derbyshire.

These ochres are often in reality good copper ores; the *Lapis Armenus* Doctor Woodward collected in Cheshire and Derbyshire, he informs us, yielded near half copper, and those from Yorkshire yielded one third and two thirds of that metal.

It is a very valuable and fine colour for painters.

In medicine, says Dr. Grew, unwashed, it works by vomit, and washed, by stool; it is highly celebrated by some, not only for its innocent, and most easy, but also most effectual operation, in such diseases as are supposed to depend on melancholy.

The confusion among authors relating to this substance, with the next to be described, and also with the *Chrysocola*, or *green ochre*, hereafter to be described, is very easy to be reconciled, by considering, that as this ochre, which has also obtained the various names of *Ceruleum æris*, *Ceruleum montanum*, *Cyaneum* or *Ceruleum metallicum*, *Terre bleue*, *Bergblau*, and *Berg l'asur*; the next, which has also obtained the same names, without any distinction; and the *Chrysocola*, are all generally found blended in masses together, they all owing their colours probably to an admixture of copper, and, as has been already observed, very often proving very rich copper ores; this circumstance has been the cause of its being so variously described, each author describing it according to the specimen he had then by him, without consulting any farther the nature of the substances themselves.

III. *Ochra ponderosa elegantissime cerulea.*

Ceruleum montanum lapideum. Wallerius's Mineral. Spec. 270. Variet. 2.

An Ochra Cupri germinans cerulea, Kupfer blumen. Linnæus's Syst. Nat. p. 205. N°. 4?

This is a very ponderous ochre, of an elegant bright mazarine blue colour, of a fine glossy talc-like appearance, sometimes of a solid, compact, regular texture, but most generally of a fibrose or plated texture; it is not hard, but breaks easily between the fingers, and scrapes with a knife, of a harsh, rough surface, and colours the hands very slightly; it does not adhere to the tongue, does not melt freely in the mouth, is pure, but of very a disagreeable taste; and does not break or moulder away in water.

Burnt, it becomes friable, loses all its colour, and acquires a dusky metallic appearance.

This is also found in copper mines, and is in reality a very rich copper ore, it yielding sometimes $\frac{4}{5}$, sometimes $\frac{1}{2}$ copper.

It is found in the copper mines in many parts of Germany. I have received exceeding fine specimens of it from the mountains of Medenbeck, in Wallachia; and I have also seen veins of it intermixed with some English *Lapis Armenus*.

It is very probable this kind of ochre is found in great plenty in China, for

I am positive the fine deep blue colour, so much used in the Chinese paintings, is this very substance.

It would make a most valuable colour for painters.

S E C T. VI. *The Green Ochres.*

M E M B. I.

Alcaline Ochres.

I. *Ochra viridis, Chrysocolla vel Viride montanum dicta.*

T E R R A *viridis, Viride montanum f. nativum, Chrysocolla, Berg-grün, Stein-grün, Schiefer-grün, Kupfer-grün, Terre verte.* Kentm. Nom. Foss. p. 16. Schwenckfeldt Cat. Foss. Siles. p. 374. Hubner Lex. Nat. et Art. p. 248. Baufchius's Sched. de Cœruleo et Chrysocolla, c. 12. p. 134. et seq. Grew's Mus. Reg. Soc. 349. Valent. Aurifod. Med. p. 6. et 56. Wolckm. Siles. Subt. p. 250. Kundm. Prompt. p. 279. N°. 19. Woodw. Meth. of Foss. p. 3. N°. 8. et Cat. A. a. 50. Cat. I. a. 34. et Cat. L. a. 33. Mus. Richt. p. 54, 65, et seq. Cramer's Ars Docimast. § 366. Bruckm. Epist. Itin. Cent. i. Ep. 2. et Ep. 76. p. 6. et Cent. ii. Ep. 54. p. 576. N°. 1, 2, et 3.

Chrysocolla. Hill's Theophr. p. 71. et p. 103. Diosc. l. v. c. 64. Vitruvius's Architect. l. vii. c. 14. Plin. Hist. Nat. l. xxxiii. c. 5. Galen l. ix. Simpl. Averroes Simpl. c. 43. Avicen. l. ii. canon. tr. c. 704. Agricola de Nat. Foss. l. iii. c. 1, 19, et 20. Cæsalp. de Metall. l. ii. c. 63. Encelius de re Metall. l. i. c. 4. et l. ii. c. 21. Aldrov. Mus. Met. p. 348. Imperat. Hist. Nat. l. iv. c. 8. 31. et 32. Boet de Boot, c. 142. Worm. Mus. p. 128. Mercat. Met. Vat. p. 67. et 75.

Ochra Cupri viridis Berg-grün. Linnæus's Syst. Nat. p. 205. N°. 2.

Cuprum solutum vel corrosum, præcipitatum, viride. Ærugo nativa, Chrysocolla Agricola, Ochra Cupri viridis, Viride montanum. Wallerius's Mineralogy, Spec. 269.

Ochra virescens. Hill's Hist. Foss. p. 65. N°. 2.

This ochre, which is found of different degrees of green, from the pale to the brightest green colour, is, as well as the blue ochres before described, a copper ore, generally very rich, and owes its production to that metal corroded and precipitated in the bowels of the earth.

It assumes various appearances, sometimes it is of a solid, compact, regular, texture, heavy, hard, so as not to be broken between the fingers, and of an even surface; sometimes quite of an earthy consistence, light, friable, and of a dusty surface; and sometimes is dry, and of a granulated structure.

In all these appearances it does not colour the hands, does not adhere to the tongue, does not melt in the mouth, is of a very nauseous taste, and does not break or moulder in water.

In the fire it loses all its colour, and generally becomes more friable.

It is always found in and near copper mines in most parts of the world; sometimes it is carried by the waters of the mines, which deposite it on the sides,

sides, and at the bottom of their adits, in form of a loose light powder; it is also found incrusting the ores of copper, and minerals accompanying them, and is also found in solid masses.

In England we find it in our copper mines in Cornwall, Yorkshire, Cumberland, and Derbyshire, &c. but not in any quantity; and Dr. Woodward collected the loose kind on the sides of the great copper vein at Goldscalp, in Cumberland, where it was brought and deposited by the waters, which continually trickled down the sides.

I am also informed, some quantity of this ochre has lately been found in the copper mines of Wicklow county, in Ireland.

It is found in great plenty in Saxony and Bohemia, at Goldberg, Kupferberg, Brausnitz, Hermanseiffen, Schatzlar, and Waltersdorff, in Silesia, and in many other parts of Germany; in the mountains of Medenbeck in Wallachia, in Poland, and in Sweden, but in the greatest quantity, and of the finest sort, in the kingdom of Hungary.

As the *Berg-grün* made in Hungary, and which is exported in great quantities to most parts of Europe, differs no otherwise from the native sort, than as the washed ochres do from those sent us in their native condition, I do not think it at all improper here to transcribe from Bruckman's Epist. Itin. Cent. i. Ep. 76. the method of collecting and preparing this valuable paint, as observed by the author himself in 1724.

The *Chrysocolle* or *Berg-grün*, says that author, is collected at Neusohl, in the mountainous territory called Herregrund, in Hungary; the waters of those mines abound with this substance; the miners, to collect it, turn and carry off these waters by numbers of wooden pipes, to great square wooden reservoirs, made of large planks, wherein the water deposits this green substance; when they have thus obtained a large quantity of the ochre, and that the reservoirs are incrustated with it to a good thickness, the water being turned off, they scrape off the *Chrysocolle* or *green ochre* from these vessels, then dry it, and divide it into three sorts; the first sort, which is the worst or common kind, is that taken out of the first or upper reservoir, wherein the water first falls; the second, or middle sort, is in like manner collected from the second reservoir; and the third sort, which is the finest and most valuable, they collect from the lower reservoir, or wherein the water flows last of all: These reservoirs are placed above each other, but communicate by means of inclining wooden pipes, so that the first is placed higher than the second, and the second higher than the third, and the water gradually flows from the uppermost to the lowest reservoir.

These ochres, thus collected, are afterwards exposed to a clear summer sunshine to dry, and are then put up for sale; the first, or worst sort, is impure, or gritty, and of a dusky green colour; the second sort is somewhat purer, of a middling colour, between the dark green of the first sort, and the bright green of the third or best sort; and the third sort is entirely fine, pure, and of a most beautiful bright green colour, and suffers no depurations or washings before it is used, as the other two sorts, which are again washed to free them from their heterogeneous parts.

At Richtergrund, about a mile from Neusohl, this ochre is also collected in the same manner, but not in so great quantities as at Neusohl.

Dr. Bruckman further observes, that this ochre can only be collected from very rich veins of copper ore, as it in reality is only a *Crocus veneris nativus*, corroded by an acid, and thus destroyed or decomposed into a powder; for the miners have always observed, that where the ore is of a poor nature, no *Chrysocola* or *Berg-grün* is ever to be found.

The *Chrysocola* is greatly used, and esteemed by painters, as a valuable and elegant colour; Imperatus observes, that the walls, paintings, &c. of the Romans with this colour, which yet remain, are as lively and as fresh as if they were but newly painted.

In medicine it likewise has its uses; it purges and vomits when used internally, which is seldom; it is externally applied for the drying up of ulcers, and sores of all kinds; and Sennertus says, he used it with great success in his ointment for scorbutic ulcers of the legs.

The *Chrysocola* of the ancients, so called for its use in soldering gold, and which name we now give to the *Borax* on the the same account, are substances which resemble each other in no one thing but that property; however, the same name having been given to two such very different substances, has proved the cause of much confusion and error among authors; even the great and learned Dr. Woodward, misled by the name, in his Method of fossils, p. 25. No. 3. talking of the *Tincal* of the Persians, from which the *Borax* is made, says, this seems to be the *Chrysocola* of the ancients: Agricola first hinted this ochre, or *Berg-grün*, to be the ancient *Chrysocola*, and since his time, it has on that account been called by that name, and allowed to be so by the generality of authors, especially the German writers. If we consider the accounts of the ancients concerning their *Chrysocola*, I cannot but think this ochre in all probability and reason to be the same substance; they describe it to be found loose and in form of sand, and of a fine green colour; of the colour of a leek, says Dioscorides; and Pliny expresses himself, *Summa commendationis est, ut colorem herbæ segetis late virentis quam simillime reddat*. He further describes it, *Humor in puteis per venas auri defluens*, but that the best was found in copper mines, and was collected in June and July, from the waters in the said mines; and further, that it was thought to be only a rotten vein of ore, *Ut plane intelligatur nihil aliud Chrysocola quam vena putris*, are his words; it was found also in silver and lead mines; to which, Agricola observes, that the ores of those other metals wherein it was found were undoubtedly also impregnated with copper, for that it is only the produce of copper. Not a more adequate description of the *Berg-grün* could have been given, than this description of Pliny's of the *Chrysocola*, viz. a corroded or destroyed copper ore, carried by the waters, and deposited by them in the mines, loose or in form of sand, of a fine green colour, and collected or prepared in the summer: but if the *Berg-grün*, has that property of soldering gold, either by itself or added to other substances, (which, tho' not expressed by the ancient authors, I take to have been the case) must be left to future enquiries.

Hill, in his Theophrastus, p. 71. erroneously imagines the *Chrysocola* of the ancients to be a sparry matter, of a beautiful green colour, found in copper mines in form of sand. In his Hist. of Foss. p. 580. he asserts, what he only hinted before, and on that account synonyms the *Chrysocola* of the ancients, *Saburra crassior, hebes, late virens, quæ Chrysocola antiquorum*. That gentleman,

to enforce his opinion, observes, that this green sparry matter is frequently found in form of sand: that it possesses the qualities of the *Chrysocolle* of the ancients, that it proved a violent emetic to a dog he gave it to, and, to crown all, roundly asserts, he has tried it in soldering metals, and has found it to serve that purpose better than *Borax*: I am sorry to criticise on any ones works, but if we consider the nature of spar, or sparry matter, I am certain it will be found to be a very unfit substance to solder any metal, and of consequence, I greatly doubt the veracity of that gentleman's assertion. The other properties, of being green, in form of sand, and found in copper mines, are all properties equally common to the *Berg-grün*, as well as to his green spar; and the emetic quality of his green spar is likewise a property common not only to the *Berg-grün*, but also to all substances whatever, which are strongly impregnated with cupreous particles.

Compound earth of a dense hard texture, consisting of clayey matter and sand intimately mixed together, probably at the time of the deluge.

Section I. The Black Loom.
M. N. I.
This loom is of a blackish colour, of a fine but loose friable texture, moderately heavy, of a rough surface, and does not colour the hands; it does not adhere to the tongue, melts readily in the mouth, and is effluvescent to the taste; thrown into water it raises a brisk ebullition, and immediately falls into powder.

It acquires a great hardness, and a pale brown colour, when burnt. This loom constitutes a stratum, in which shells are lodged, at Woolwich. Lead pits in Kent; but is made no use of.

Section II. The White Loom.
M. N. I.

This loom is of a dull greyish white colour, heavy, of a coarse, friable texture, very hard, and gritty to the touch, and does not colour the tongue, melts readily in the mouth, and is effluvescent to the taste; thrown into water it raises a brisk ebullition, and immediately falls into powder.

SERIES

S E R I E S I.

C H A P. III.

Earths naturally and essentially compound, and never found in the state of pure earths.

G E N U S I.

L O A M S.

Compound earths of a dense harsh texture, consisting of clayey matter and sand intimately mixed together, probably at the time of the deluge.

S E C T. I. *The Black Loams.*

M E M B. I.

Loams which are not acted upon by acids.

I. *Terra miscella subnigra.*

THIS loam is of a blackish colour, of a fine but loose friable texture, moderately heavy, of a rough surface, and does not colour the hands; it does not adhere to the tongue, melts readily in the mouth, and is astringent to the taste; thrown into water it raises a brisk ebullition, and immediately falls into powder.

Burnt, it acquires a great hardness, and a pale brown colour.

This loam constitutes a stratum, in which shells are lodged, at Woolwich sand pits in Kent; but is made no use of.

S E C T. II. *The White Loams.*

M E M B. I.

Loams which are not acted upon by acids.

I. *Terra miscella albida.*

T*Hraustomietbes albida.* Hill's Hist. Foss. p. 424. N^o. 1.

This loam is of a dull greyish white colour, heavy, of a coarse, lax, crumbly texture; very harsh, and gritty to the touch, and does not colour the hands; it adheres slightly to the tongue, melts freely in the mouth, and in water it immediately breaks into a loose powder.

In

In the fire it acquires a little hardness, and a pale brownish red colour. It is dug in many parts of the kingdom, in Northamptonshire, and Staffordshire especially, in great plenty.

SECT. III. *The Yellow Loams.*

MEMB. I.

Loams which are not acted upon by acids.

I. *Terra miscella flava.*

THIS is of a deep yellow, near an orange colour, fine, soft, moderately heavy, of a firm compact hard texture, and has some particles of a glittering talc in it, of an even surface, and slightly colours the hands; it adheres not to the tongue, melts freely in the mouth, is astringent to the taste; and in water it immediately falls into powder.

Burnt, it acquires a pale red colour, but no hardness.

It is found in many parts of this kingdom; I observed great quantities of it upon Hampstead Heath, but it is as yet made no use of.

Woodward, Cat. A. a. 100. exhibits a loam (of a yellow colour) very fine and soft, with very small spangles of *micæ* in it, used for moulds by the bell founders, from Thrup in Northamptonshire, which very probably is this species of loam.

II. *Terra miscella sordide flava.*

Thraustomietbes sordide flavescens. Hill's Hist. Foss. p. 426. N^o. 5.

A very heavy, friable, coarse loam, of a deep dusky yellow colour, of a loose incoherent texture, of a rough harsh surface, and does not colour the hands; it adheres slightly to the tongue, melts readily in the mouth, and thrown into water, it immediately breaks into powder.

In the fire it acquires little hardness, and a deep red colour.

It is dug in most parts of this kingdom, and is used in brick-making, mixed with the tough fine clays.

III. *Terra miscella pallidissime flavescens.*

Glischromietbes pallidissime flavescens. Hill's Hist. Foss. 428. N^o. 2.

This loam is of a very pale yellow colour, moderately heavy, and very hard, of a dense firm compact texture, and spangled with talcy particles, of a tolerably smooth surface, and does not colour the hands; it does not adhere to the tongue, melts but slowly in the mouth, and soon breaks into a loose powder in water.

In the fire it acquires a fine red colour, without any considerable hardness.

It is dug in many parts of the kingdom, and is used for making of bricks.

SECT.

SECT. III. MEMB. II.

*Alcaline loams.*IV. *Terra miscella pallide flavescens.***T***Hraustomiethes pallide flavescens.* Hill's Hist. Foss. p. 425. N^o. 3.

This loam is of a very pale yellow colour, heavy, of a loose crumbly texture, and glittering with talcy particles, of a rough uneven surface, but not very harsh to the touch, and does not colour the hands; it adheres to the tongue, melts freely in the mouth, and soon falls into a loose powder in water.

In the fire it acquires a red colour, and a considerable hardness.

It is dug in most counties in England, and is used in brick-making, when worked up with the tougher clays.

SECT. IV. *The Brown Loams.*

MEMB. I.

*Loams which are not acted upon by acids.*I. *Terra miscella luteo-fusca dura.***W**OODW. Cat. A. a. 101.

Tbraustomiethes flavescens, durior et aspera. Hill's Hist. Foss. p. 425. N^o. 4.

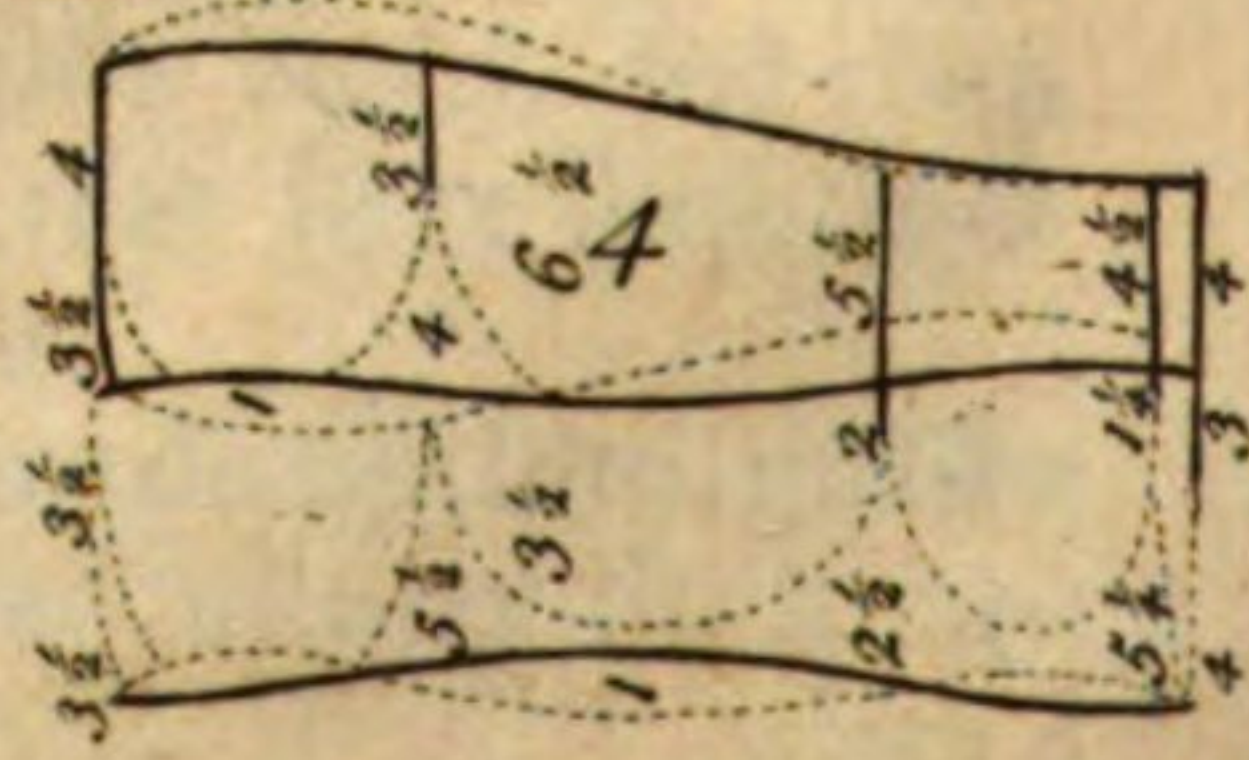
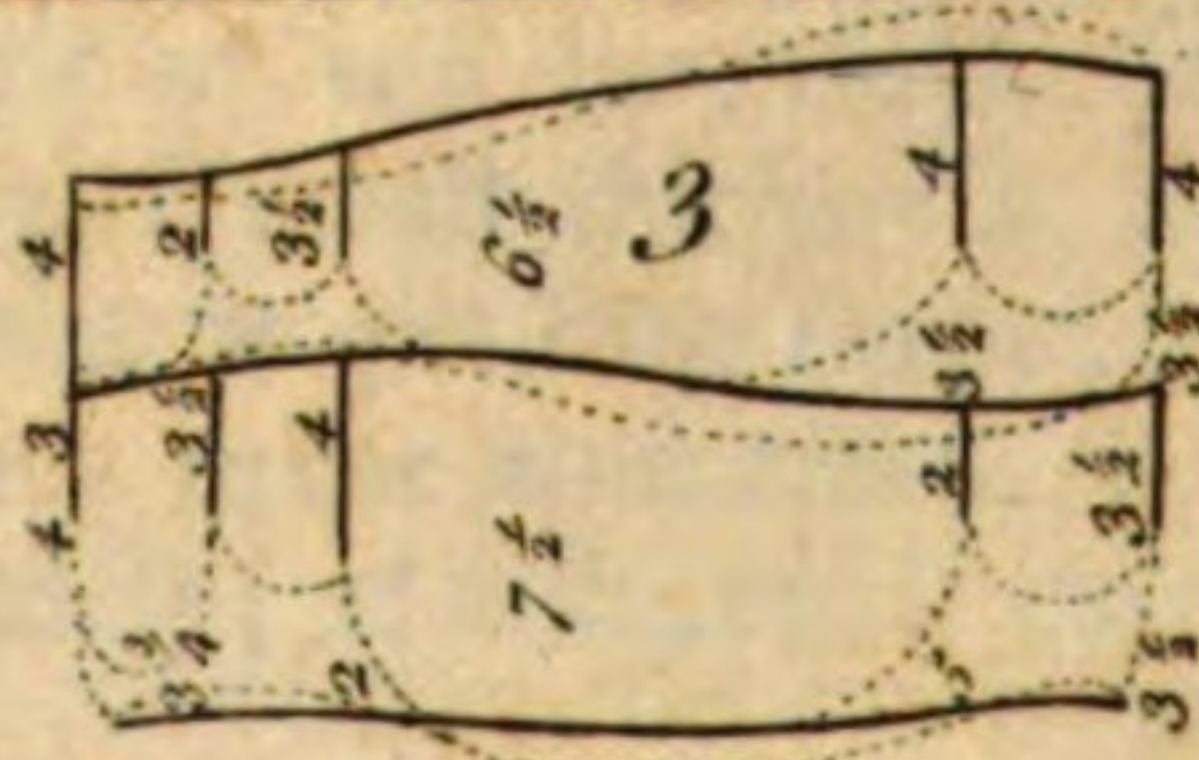
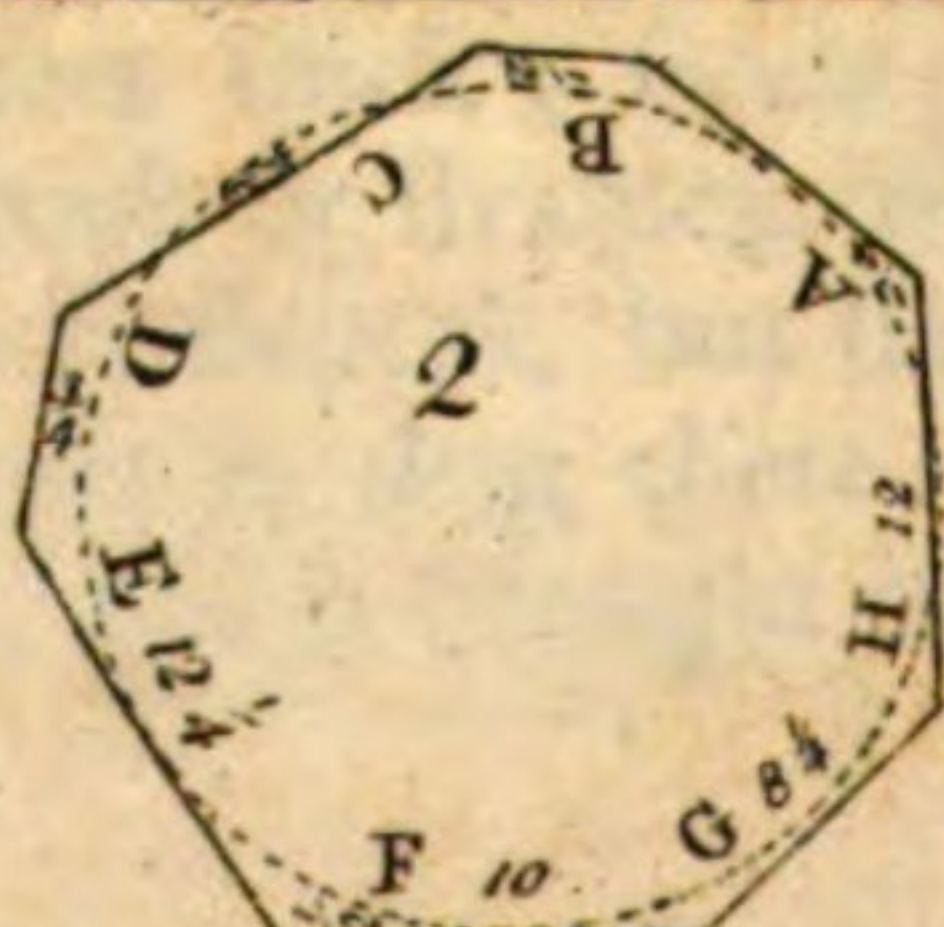
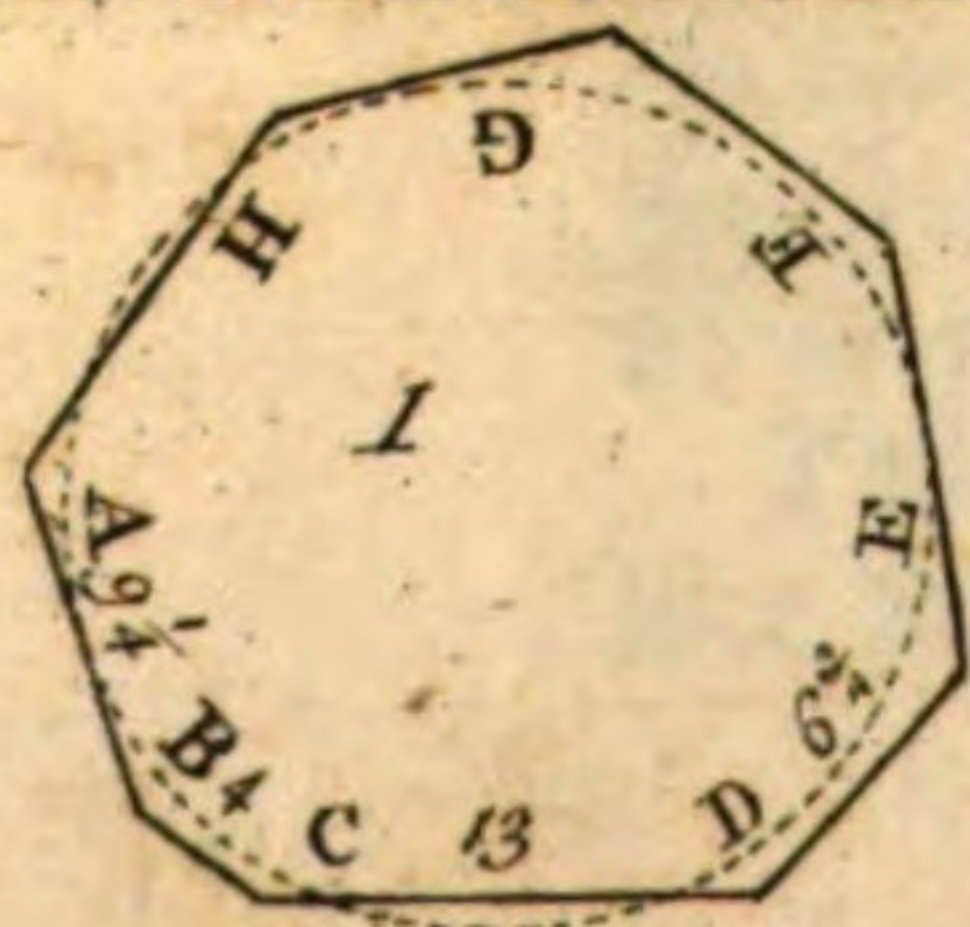
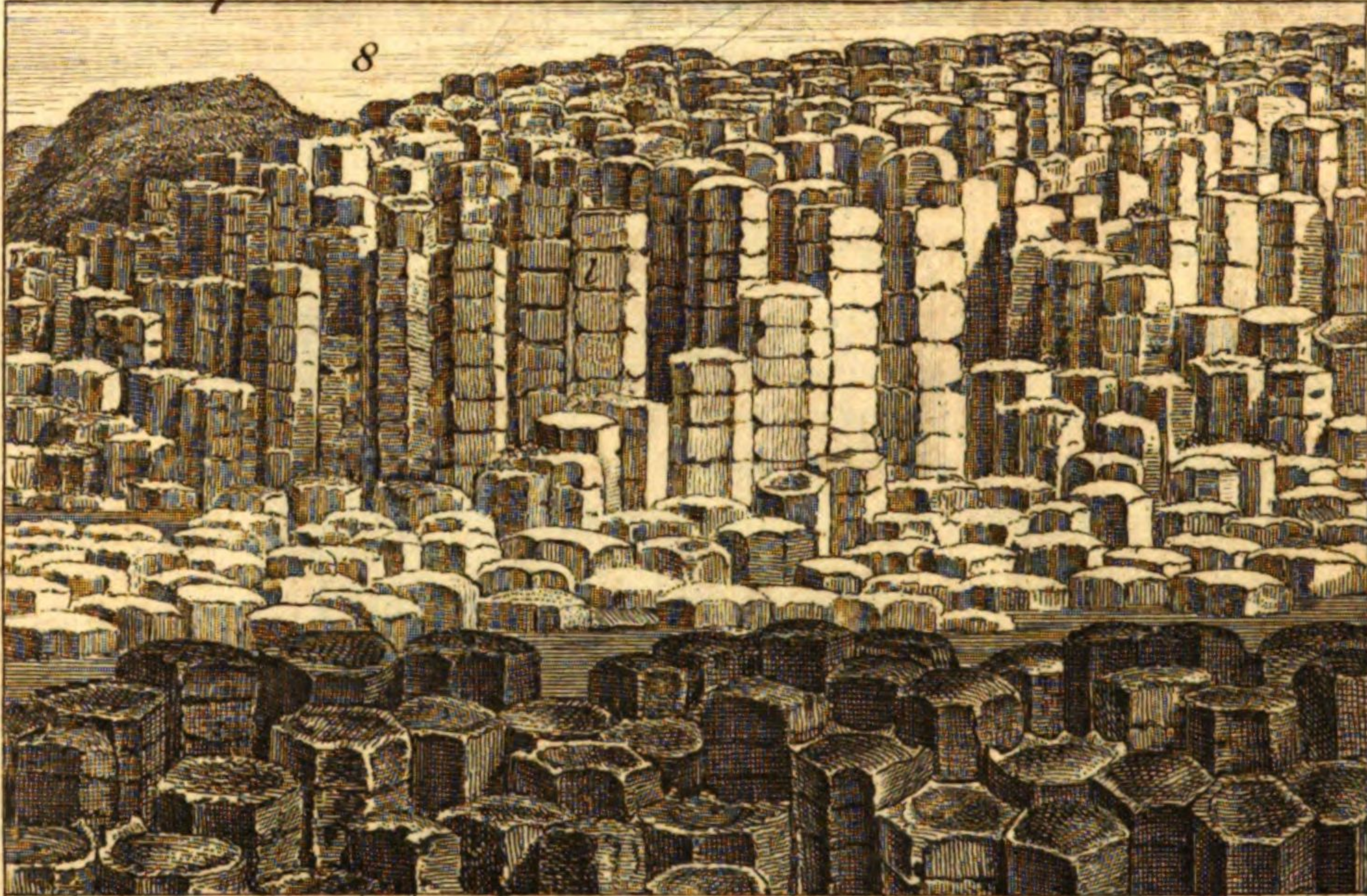
This is of a yellowish-brown colour, and is often variegated with veins of white, of a coarse but very compact texture, very hard and heavy, of a rough harsh surface, and very slightly colours the hands; it does not adhere to the tongue, melts readily in the mouth, and is extremely coarse between the teeth; in water it immediately breaks into powder.

In the fire it acquires a considerable hardness, and a fine deep red colour.

It is dug at Hedgerly, a village in Buckinghamshire, not far from Windsor. According to my observations this loam seems to be one of the strata of the soil for some extent thereabouts; the disposition or order of the strata there is as follows, a common vegetable mould with gravel eight or nine feet deep; sands coarse and fine blended together, but not regularly distinguished into strata twelve or fifteen feet thick; then this loam, which by the diggers is vulgarly called *fire earth*, in some places only three or four feet thick, and in others till seven feet thick; sands to eight or ten feet thick follow again, and then the chalk rock or stratum, which is of a vast thickness, as they have sunk in it to very great depths, but have never as yet dug through it.

This loam is dug there in very great quantities, is made up into masses like bricks, and is brought to London; it is likewise carried all over the kingdom;





dom, and, as I am credibly informed, is also exported into foreign parts in no small quantities; it is generally called Windsor loam.

It is a very valuable loam, and is greatly used for making the bricks, employed in building the wind and other furnaces, for melting of iron, it endures the glass house-fire, and is excellent for lutes of assay furnaces, chemical furnaces, &c.

II. *Terra miscella fusca.*

Woodw. Cat. E. a. 18.

Tbraustomiethes durissima fusca. Hill's Hist. Foss. p. 426. N^o. 6.

A loam of a dusky brown colour, very hard and heavy, of a firm compact texture, of a harsh rough surface, and does not colour the hands; it adheres pretty firmly to the tongue, breaks pretty freely in the mouth, and is very coarse between the teeth; in water it does not readily disunite or fall into powder.

It burns to a deep red colour, without any additional hardness.

It is dug in many parts of this kingdom; in the great sand pits near Woolwich, it lies underneath the loam in which the shells are found; it is used, says Dr. Woodward, in the iron foundery there, for casting of cannon balls, bombs, &c. and is also used in other founderies about London.

In Northamptonshire, says Hill, where shells are found lodged in it, they call it *penny earth*, and use it for floors of barns, roofs of ovens, &c. for when well beat together, it dries into a very firm hard mass, of little less hardness than plaister of Paris, and bears the weather extremely well.

SECT. IV. MEMB. II.

Alcaline Loams.

III. *Terra miscella flavo-fusca.*

T*Hraustomiethes flavo-fusca.* Hill's Hist. Foss. p. 427. N^o. 8.

This is of a pale yellowish brown colour, of a coarse loose crumbly texture, moderately heavy, of a rough surface, and does not colour the hands; it does not adhere to the tongue, melts freely in the mouth, and immediately breaks into powder in water.

It burns to a fine high red colour, without any additional hardness.

It is dug in many parts of the kingdom, and is commonly used in brick-making.

SECT. V. *The Green Loams.*

MEMB. I.

*Loams which are not acted upon by acids.*I. *Terra miscella virescens.*

MARGA *arenosa friabilis virescens.* Hill's Hist. Foss. p. 49. N^o. 2.
Woodw. Cat. A. a. 102.

This is a coarse loam, of a dusky green colour, but is greatly variegated with a slight rust coloured earth, with which it is frequently mixed; it is heavy, moderately hard, of a pretty compact irregular texture, of a harsh rough surface, and does not colour the hands; it adheres very firmly to the tongue, melts freely in the mouth, is very astringent to the taste, and in water raises a considerable ebullition, and immediately breaks into powder.

In the fire it burns to a considerable hardness, and a dusky red colour.

It is found in this kingdom, but in no very great quantity. Dr. Woodward collected it on Hampstead Heath, near the mineral spring, in considerable plenty; Hill observed it in Leicestershire, Northamptonshire, in the Hedgerly loam pits in Buckinghamshire, and in Suffex; in which latter county, he informs us, it is used as manure for clayey lands.

Dr. Woodward, Cat. C. a. 19. exhibits an earth, grey, with a cast of green, very styptic, being part of a stratum, near the bottom of Hordell Cliff, between Limington and Christ Church, Hampshire, which probably is this species of loam.

S E R I E S I .

C A P . I I I . G E N U S I I .

M O U L D S .

Compound earths of a loose soft texture, somewhat ductile while moist, and composed of earthy particles, mixed with the putrified remains of animal and vegetable bodies.

S E C T . I . *The Black Moulds.*

M E M B . I .

Moulds which are not acted upon by acids.

I. *Humus atra communis.*

TERRA nigella vegetabilis dædala, Garden earth or under turf earth. Woodw. Meth. Foss. p. 4. N^o. 21.

Common vegetable mould. Woodw. Cat. A. a. 110. Ej. Nat. Hist. of the earth, 2d. edit. p. 12.

Humus communis atra. Humus atra. Terra nigella. Woodward. *Terra dædala. Terra fertilis nigra.* Wallerius's Mineralogy, species 1.

Humus nigrescens hortorum. Woltersdorff Syft. Min. p. 11.

This is of a blackish colour, tenacious while moist, of a fine, soft, loose texture, and heavy, it colours the hands, melts readily in the mouth, and is pretty freely diffusible in water.

In the fire it acquires some hardness, but suffers little change of colour.

This mould is the most common surface of our globe, and is compounded of earthy matter, and the putrified remains of animal and vegetable bodies.

Woodward Nat. Hist. of the earth, passim; Morton, Nat. Hist. Northamptonshire, p. 34. and Scheuchzer, Oryctographia Helvetica, p. 99. imagine, that before the deluge the earth was quite covered with this mould; and to this cause they attribute the great fertility of the Antediluvian times.

Scheuchzer also observes, that even on the top of the Alps, where no plants grow, a pure blackish mould is found, more elastic, or rather more susceptible of extension, than any other known earth, and which cannot be vitrified; by the microscope it also seems to be entirely homogeneous, or the minutest particles of it to be all of a similar nature.

Some naturalists have supposed it not impossible to determine the exact time of the deluge, by the yearly accretion of this mould; but as by experience we find, that the accretion of this earth is only about half an inch in a century,

on making the calculation on a computation of half a foot thick of mould every where, we shall find the deluge to have happened only two thousand four hundred years ago, whereas we are certain it is above four thousand years ago, that divine scourge fell on our globe.

It is likely, says Wallerius, that the vegetable mould has not always the same properties; some years, by chemical trials, it is found to contain more acid; in other years it is more alkaline; these differences proceed from the vicissitudes of our atmosphere, and to this cause may be referred the greater or lesser fertility of lands in different seasons.

II. *Humus vegetabilis lutosus, Turfa dicta.*

Humus vegetabilis lutosus, Humus palustris, Turfa Aust. Turfa lutosus, Torvena Libavii, Humus uliginosa. Wallerius's Mineralogy, species 5.

Humus atra palustris, Humus paludosa. Wolterfdorff Syft. Min. p. 11.

Ephem. Phys.-Med. Acad. Cæs. Leopold. Carol. Nat. Curiosor. vol. i. p. 228. Observ. 115. *De Turfis, seu Cespitibus foco Batavorum instruendo servientibus* à Lic. Rosino Lentilio.

This mould is of a brownish black color, not so soft or fine as the common vegetable mould, but of a more loose and harsh texture, and is always full of fibres, roots, and other putrified remains of vegetables.

Wallerius makes three varieties of this species, viz. 1. *Humus palustris in igne non fœtens*; this sort is porous and easily catches fire, it is the common turf or fuel of the Dutch.

2. *Humus palustris in igne fœtens.* This sort is always found near the shore, and probably the salt, and some other substances it contains, are the cause of the disagreeable smell it emits while burning; it is very compact, and does not easily catch fire; the turf of Zealand is this kind.

3. *Humus palustris nigra.* This is black, and the smiths use it in their forges in Sweden.

The *Peat*, which is found in many places of Germany and this kingdom, is a bituminous substance, and does not appertain to this class of fossils.

The turf is dug in marshy places in Holland, and which are called in Dutch *Veenes*; it is cut into masses like bricks, and after being dried in the open air, is the common fuel of the inhabitants of Holland.

SECT. II. *The Red Moulds.*

MEMB. I.

Alcaline Moulds.

I. *Humus rubra.*

T *Hruptomitbes rubra.* Hill's Hist. Foss. p. 429. N°. 1.

This mould is of a pale red colour, of a very loose sandy texture, and moderate weight, of a rough, uneven, and dusty surface, dry and harsh to the touch, easily crumbles to powder between the fingers, and slightly colours the hands;

it

it adheres pretty firmly to the tongue, breaks freely in the mouth, but is very coarse and gritty between the teeth; in water it raises a slight ebullition, and very quickly moulders into a reddish sandy powder.

This is a soil very apt to crack in dry weather, but the cracks soon fill up, the earth at their sides mouldering to powder, and falling in; in wet weather it is less apt to be dirty than other soils, as it soon soaks up the rain, and never is at all viscid or clammy.

It burns to a loose crumbly mass, of a fine florid red colour.

This soil is frequent in many counties of the kingdom; it is accounted a very fertile and good land, and particularly succeeds well with crops of rye, barley, or peas.

Smith's Nat. and Civ. Hist. of the county of Cork, vol. ii. p. 361. informs us, that this is the common soil on the north side of the city of Cork, in Ireland; the farmers there call it a red-stone soil; and he further observes, that there it will not produce without a manure of lime or sea sand.

Wallerius Mineralogy, species 2. exhibits a *Humus rubra*, *Terra Anglica rubra auctorum*, *Terra Rubella*, *Terra Zoica*, *Terra Adamica*, *Terra Damascenica*, which answers to this species of mould, excepting that his *Humus* does not make any effervescence with aqua-fortis, or any other acid, and which indeed is one of the characteristics of his genus of moulds; the said author recounts two varieties of it, viz. 1. *Humus rubra pallide rubescens*, of which kind they find in Helsingland in Sweden, and near Nuremberg in Franconia; and 2. *Humus rubra obscure rubescens*, of which kind, says he, is the English red earth. I cannot but think, that notwithstanding the difference alledged (which perhaps may be an inadvertency of that learned author) his is the same species as this red mould.

The name of *Terra Adamica* and *Terra Damascenica*, is given it, on a ridiculous supposition, that Adam was made of this species of mould. The soil round Damascus is a red earth, probably this species, and the Turks are said to assign it great virtues, and to sell it to travellers on that very account; see Bruckm. Epist. Itin. Cent. ii. Ep. 94. p. 1192.

SECT. III. *The Brown Moulds.*

M E M B. I.

Moulds which are not acted upon by acids.

I. *Humus griseo-fusca.*

G *Loiomiethes griseo-fusca, tenax.* Hill's Hist. Foss. p. 429. N°. 1.
This is a tough and considerably heavy earth, of a pale greyish brown colour, of a moderately firm texture, but apt to be full of small pebbles, of a rough, rugged, but not dusty surface, and somewhat harsh to the touch; it does not colour the hands, breaks very easily into irregular pieces, but is not easily crumbled to powder; it adheres to the tongue, melts pretty freely in the mouth, is of a disagreeable taste, and very coarse and gritty;
in

in water it raises a slight ebullition, soon falls into small peices, and thence crumbles to powder.

This soil is very apt to crack and separate in dry weather, and is what is called greasy and slippery after rain.

It burns to a faint red, with a little additional hardness.

It is a common soil in Buckinghamshire, Lincolnshire, and Northamptonshire, and is known to the farmers by the name of white land.

It produces barley better than almost any other soil.

SECT. III. MEMB. II.

Alcaline Moulds.

II. *Humus luteo-fusca.*

G *Loiomiætes luteo-fusca ponderosa*. Hill's Hist. Foss. p. 430. N^o. 2.

This is a very heavy and somewhat tough earth, of a deep yellowish brown colour, of a friable loose texture, of a rough rugged surface, dry, harsh, and dusty, and slightly colours the hands; it does not adhere to the tongue, melts slowly in the mouth, and is very coarse and gritty between the teeth; in water, after some time, it falls into small lumps, and from them into powder.

It burns to a pale red, with very little hardness.

It is common in Lincolnshire, Suffex, and Cornwall, and is accounted a tolerably rich land.

OBSERVATIONS ON SERIES I.

THE first series, which is of fossils that are not inflammable, but are divisible and diffusible, tho' not soluble in water, contains only one class, which is the earths.

EARTHS,

Are bodies of no regular structure, or determinate figure, opaque, insipid, friable or composed of particles not strongly cohering together, not inflammable, divisible and diffusible, but not soluble in water, and ductile while moist.

The class of earths is to be ranged into three heads or chapters, which contain seven genera.

Chap. I. Earths naturally moist, of a firm texture, and which have a smoothness like that of unctuous bodies; this chapter contains three genera, viz. 1. the boles, 2. the clays, and 3. the marles.

Chap. II. Earths naturally dry or harsh, rough to the touch, and of a looser texture. This chapter contains two genera, viz. 1. the chalks, and 2. the ochres.

Chap. III. Earths naturally and essentially compound, and never found in the state of pure earths. This chapter contains two genera, viz. 1. the loams, and 2. the moulds.

The ancient authors contented themselves, with only dividing the earths according to their uses, viz. into medical earths, and earths used in pottery, in painting, and for other mechanical purposes.

This division of earths being found very confused and incorrect, tho' generally followed, Dr. Woodward (1), made a more natural division of them into 1. smooth or unctuous earths, which he again subdivides into those that adhere to the tongue; and those that do not, and 2. those that are dry, harsh, and rough to the touch.

Dr. Woodward's method, tho' more perfect than the former, yet remains very incorrect.

Later authors, as Stahl, Hebenstreit (2), Pott (3), Baillou (4), Linnæus (5),

(1). Woodward's Method of fossils, p. 1. et seq.

(2). Hebenstreit de terris Lips. 1745.

(3). Pott. Lithogeognosia.

(4). Cav. Giov. de Baillou Compendio del Metodo analitico di cui si è servito

per la sua grand' Opera, la qual contiene il trattato universale delle pietre preziose, metalli, minerali, e altri fossili, &c. p. 214.

(5). Linnæus's Systema Naturæ.

Wallerius (6), Woltersdorff (7), and Hill (8), have since formed other methodical dispositions of these fossils; and which, as they have their imperfections and beauties, I shall hear subjoin.

Stahl divides the earths into the *Calcareæ*, or those which burn into lime, and are alkaline, and into those which are vitrifiable: a division too general for such a numerous class of bodies, and also very erroneous.

Hebenstreit runs into a confused method of metallic earths, inflammable earths, medicinal earths, mechanical earths, &c.

Pott and Baillou divide them into, 1. alkaline or calcareous earths, 2. vitrifiable earths, and 3. argillaceous earths, and suppose that the various kinds are only to be regarded as combinations from these three divisions. This method is very erroneous, as we are sensible there are several kinds of earths highly alkaline, and yet also vitrifiable, *e. g.* the yellow Armenian, the Tockay and Blois boles, &c.

Linnæus erroneously makes the sands his fifth division, on account that he supposes it a primitive earth, from which, and the elements, says that author, all the *Regnum lapideum* is produced. The sands are, however, a class of fossils, quite distinct from earths, and which do not less differ from them than from metals and minerals.

Wallerius has divided the earths into three orders, *viz.* 1. those that are harsh and dry, as the moulds and chalks; 2. those that are smooth, as the clays and marles; and 3. those that are mineral, metallic or the ochres, sulphureous or saline.

Woltersdorff only divides them into two orders, of *argillofæ* and *alkalinæ*; the erroneousfness of which method has been already noted.

Hill's method is good, except that he makes a genus of *Tripolis* instead of chalks, and that his genus of marles, of which further notice will be taken, is an inextricable scene of confusion.

The smooth earths, as the Lemnian, &c. says Dr. Grew (9), are commonly called *pingues* or *fat*, absurdly for *laeves* or *subtiles*. Their seeming pinguitude proceeding only from the exquisite fineness of the particles of which they consist.

I take the principal difference, says the same author (10), between earths, as applied to medical use, to be this; that some are not affected with acids; others are: those, *pauperes* or *fatuæ*, coming nearer to simple or mere earths; these saline, or impregnated with a mineral *alkali*, and therefore of greater energy.

Henckell (11), judiciously observes, what great care and judgment should be had in the application of crude or native earths, for internal use in medicine; they ought says, that author, to be duly prepared and examined, not only by the physician, but also by the mineralist; all those earths which are found near the surface of the earth, or constitute strata, or else are found

(6) Wallerius's Mineralogy.

(7) Woltersdorff Systema Minerale.

(8) Hill's Hist. Fossils.

(9) Grew's Mus. Reg. Soc. p. 347.

(10) Grew Ibid. p. 348.

(11). Ephem. Nat. Curios. Vol. ii. p. 364. Obs. 156. and is an account of an Arsenical earth by Joh. Frid. Henckel.

lodged in stone, or marble quarries, &c. in short all those kinds which are not dug from mineral and metallic veins, or in their neighbourhood, are greatly to be preferred; but all those earths which are found in veins of mineral or metallic matter, are to be used with the greatest caution; as by fortuitous causes, they may often be impregnated with the noxious qualities of the mineral and metallic bodies.

The ochres, umbres, and other earths, which are found in strata, says Woodward (12), are commonly mixed, foul, coarse, and gross: but those found in fissures of other strata, consist of matter extremely small, subtile, and even impalpable. Indeed being found in the perpendicular fissures of the strata, it could not be otherwise; for all the matter that composes them, must have passed the pores of those strata before it could arrive at those intervals; which it could never have done, had it not been very subtile and fine. This constitution of these earths renders them, far above all others, fit for colours for the use of the painters.

There is very little earth that does not contain some salts in it, says the same author (13). 'Tis very providential, indeed, that those salts are so dispersed in it; they serving to mellow the earth, as the husbandmen speak, to open, loosen, and disentangle the matter that serves for the increment, and formation of vegetables.

Earths may be considered as the basis or *prima materia* of stones, to the formation of which, nothing further is required, than a proper substance to unite them and harden them into solid bodies.

The *Steatitæ*, *Morocktus*, *Galaetites*, &c. I have ranked among the earths, as being only indurated clays; I am well apprized, that they are ranked by some authors among the talcy fossils, on account of their constitution, which certainly is somewhat talcy; but as their basis is a true earthy substance, I rather conclude they should be ranged in this series, as I have done.

Tho' I have also ranked the common turf or fuel of the Dutch among the moulds, I have only done it in respect to its earthy matter; which seems to me to be a mould of a distinct species; but the peat, or bituminous turf, on account of its principles, is justly to be ranged in the series of bituminous fossils.

The brown earth used by painters, and known by the name of *Cologn earth*, as being chiefly found near that city of Germany, I have excluded from among the native fossils, as I am convinced it is only wood thus changed in the bowels of the earth. Wallerius (14) makes it a variety of the umbre, which he ranks among the *hum*i or moulds; and Libavius (15), judges it a bituminous substance, as he also does the umbre; Bauschius (16) even calls it *umbria ampelitis*; Hill (17) ranks it among the ochres, and calls it, *pseudo-ochra*, but at the same time he also judiciously observes, it is rather fossil wood than a native fossil.

(12) Woodward's Cat. A. a. 65.

(13) Woodward's Cat. A. a. 104.

(14) Mineralogy, species 3.

(15) Singul. Part. iii. l. viii. c. 7. p.

1030.

(16) Sched. de Cœruleo et Chrysocollo, p. 55.

(17) Hist. Foss. p. 63. N°. 2.

Besides the many true species of earths, combinations or compounds of various sorts of earths, all blended together, are frequently found in digging; these mixt masses, which owe their origin to their being blended together, at the time of the subsidence of the strata, cannot be referred to or reckoned of any determinate species; combinations may be produced beyond thought; Kircher (18), from twelve simple qualities of earth, has reckoned the combinations of them to amount to no fewer than four hundred seventy nine millions one thousand six hundred sorts.

As to the earths celebrated by the ancients, and of which they have transmitted to us some description or characteristics to know them by, such are the *Lemnian*, *Eretrian*, *Samian*, *Cbian*, and *Melian* earths; the *Paretonium*, the *Melitites*, the *Morocktus*, the *Galactites*, the *Cimolia*, the *Rubrica Sinopica*, the *Creta*, and the *Chrysocolia*, I have ventured to affirm them in my descriptions, to be the same substances known to the ancients. To others, the accounts of which are at best but obscure, as the *Sil Achaicum*, the *Creta Selinusia*, and the *Alana Gleba*, &c. I have contented myself with giving the opinions of authors, or hints of my own opinion; but to the others, which are but named, as the *Glischromargos*, the *Capnumargos*, the *Marga Columbina*, the *Tasconium*, the *Sil Atticum*, the *Sil Marmorosum*, the *Creta Sarda*, *Creta Umbrica*, and *Creta Thessalica*, &c. as the definitions of these bodies cannot be justly made, and that conjectures are very fallacious, I have entirely omitted taking any notice of them in my history.

Altho' in my definition of the marles (19), I have expressed myself in these words; *not in the least ductile while moist*; and I also have not either to the genera of chalks, ochres, and loams, mentioned any thing of their ductility; yet those definitions are given, and are only to be understood, in a comparative manner, in regard to the whole series of earths; for in reality, as that great naturalist *Monf. de Reaumur* observes (20), the most remarkable characteristic of earths, is a kind of ductility they have, which neither any other mineral or metal have in that manner. Its ductility I mean is like that of paste, when kneading. Earth is capable of being kneaded when moistened or soaked in water, it softens, extends, and takes all forms in the workman's hands, and afterwards retains the said forms. All earths have not an equal kind of ductility; but more or less of the former, are all the fat earths so called, of the latter what are simply called lean earths.

Several authors do not make a distinct genus of the boles, but rank them among the clays; indeed very essential characteristics are wanting to make them different genera, for only the extreme fineness of the particles of the boles is the cause of their being not so ductile or viscid as the clays, insomuch that, speaking with propriety, they are only to be accounted very fine clays; I have, however, made them separate genera, as custom hath authorised it.

(18) *Mundus Subterraneus*, l. vii. c. 3.
p. 356. et *De arte combinatoria*. See
also *Evelyn's treatise on earth*.

(19) p. 63.

(20) *Hist. et Memoires de l'Acad.*

Roy. des Sciences anno 1730. *Memoire de la Nature de la Terre en general, et du caractere des differentes especes des terres*, par *Monfieur de Reaumur*.

Authors generally run into extremes. Wallerius has not only denied a separate genus to the boles, but has even ranked all those earths under one single species, by the name of *Argilla pinguis*, *Bolus*, *Terra sigillata*; and (21), makes all the white boles only one variety of the species, and all the grey, yellow, red, green, and black boles, as many other varieties of the same species. That author has gone further in the observation he adds to that species: he says, "The writers on fossils are full of loathsome descriptions of several species of boles; but none of those authors have ever given themselves the trouble, to make due observations on that matter. A bole, if made up into a small round cake, and impressed with the seal of any country, jealous that its bole will be counterfeited, it is immediately called *Terra sigillata*." These are that learned author's words, which must be partly retorted on himself; for had he made the due experiments he requires of others, he would have been convinced there were many very different species of the *Terræ sigillatæ*, or boles, even species as essentially different as any bodies of the same genus can be.

The various and contradictory definitions, which have been given by late authors to the genus of marles, are worthy observation; one author sometimes has defined them to be argillaceous, at other times alkaline earths (22), a second (23), calls them alkaline, calcareous, harsh, and friable; while a third (24), makes them quite, on the contrary, indurated earths, and not to be easily softened with water; and a fourth (25), again defines them to be earths but slightly coherent, stiff or viscid while moist, most easily diffusible in and disunited by water. This latter author is very remarkable in the contradictions he gives himself; for he has placed under this his genus of marles, some indurated earths, as the *Rubrica*, *Fabrilis*, &c. others quite loose or powdery, and which have no visciduity while moist, as the *Agaricus mineralis*; others quite harsh and rough to the touch, as common chalk; and others, on the contrary, smooth or somewhat unctuous; as the fullers earth, &c. substances widely different from each other, and is what by judicious naturalists must be thought a strange and unaccountable confusion.

The chalks are generally defined to be calcareous and highly alkaline; even some authors have gone so far, as to fix a characteristic of colour on them, and to allow them to be only white; tho' the chief species, and from which the whole genus is denominated, possesses all those three properties, yet I have judged it very unnecessary to fix them as characteristics on the whole genus; I have taken the more obvious properties as my standard, and while an earth of a looser texture is hard and dry, harsh and rough to the touch, and readily diffusible in water, I shall not hesitate to rank it in the genus of chalks, altho' it makes no effervescence with acids, nor is of a calcareous nature.

Ochres are only the *residua* of the solutions of metals and minerals. Those metals only, says Wallerius (26), which carry their own dissolvents, produce ochres; that is to say, they are only those which can be decomposed by water or by a slight sulphureous vapour, which produce their ochres; the others

(21) Mineralogy, species 23.

(22) Henckell.

(23) Woltersdorff Syft. Min. p. 46.
Obf. 7.

(24) Linnæus, Syft. Nat.

(25) Hill's Hist. of Foss.

(26) Mineralogy, order or division iii.
§ 22.

produce none; to the same cause we owe the production of the different vitriols. In reality, ochres are metallic earths, which separate from the vitriols when they are dissolved by the waters; from which we may conclude, and establish, as a certain principle, that as long as we cannot find a vitriol of gold, of silver, of lead, of tin, of bismuth, &c. we can deny the existence of any ochres of those metals.

The *Lapis Armenus*, the *Ceruleum nativum*, and the *Chrysocola*, which are in reality rich copper ores, I have placed among the ochres for the above reason, as they are only the residua of the solutions of that metal.

The ochre called *Giallolina* f. *Terra flavescens* by Woodward (27), and by Hill (28), *Ochra ponderosa friabilis aureo-crocea, quæ Giallolino authorum*, is a factitious substance or preparation of lead; and is, on that account, excluded from this history.

The moulds which are bodies compounded of earthy matter, mixed with the putrified remains of animals and vegetables, have, strictly speaking, no right to a place in a history of fossils.

(27) Meth. of Foss. p. 4. N°. 17. et Cat. I. a. 28. (28) Hist. of Foss. p. 56. N°. 11.

NATURAL HISTORY

OF FOSSILS.

SERIES II. STONES.

CHAP. I.

Stones found forming continued strata, coarse, harsh, and rough, of a lax texture, of a visible grit or grain, resembling sand in form, usually immersed in a cementitious matter, of little brightness, and scarce capable of any polish.

GENUS I.

Stones harsh and rough, and composed of a visible grit, not of a laminated structure, and splitting equally in any direction.

SECT. I.

Alkaline sand stones.

I. *Saxum arenarium Portlandicum.*

WOODW. Cat. A. b. 12.

Psadurium hebes, albidum, laxius. Hill's Hist. Foss. p. 436. N^o. 4.

Of a pale or dull whitish colour, heavy, moderately hard, of a somewhat lax texture, and is composed of a large roundish grit, cemented together by an earthy spar, and intermixed with numerous glittering spangles of pure spar, the grit splits in the cutting of the stone, so that it is capable of being brought to a surface very smooth and equal.

It will not strike fire with a steel.

It burns to a slight ashen hue.

I

There

There are vast quarries of it in the island of Portland in Dorsetshire, from whence it is brought in vast quantities to London, and is greatly used in building.

This, and all like sorts of stone, that are composed of granules, and are not of a laminated texture, will cut and rive in any direction, as well in a perpendicular, or in a diagonal, as horizontally and parallel to the site of the strata. 'Tis for this reason that they have obtained the name of *Free-stone*; they likewise bear the injuries of the weather equally and indifferently in all positions.

II. *Saxum arenarium Surreiense, vires ignis optimè ferens.*

Woodw. Cat. A. b. 1.

This is a coarse, harsh, dusty freestone, of a moderately compact texture, of a pale greyish colour, near white, with a very slight admixture of greenishness; it is moderately hard and heavy, and slightly colours the hands; it is composed of a fine small angular grit, cemented by an earthy sparry matter, intermixed with numerous small spangles of a silvery mica.

It will not strike fire with a steel.

In the fire it changes to a slight reddish hue.

It is dug in great quantities at Reygate, Chaldon, Bletchingley, Godstone, and the adjacent places in Surry. The soil near these quarries is generally a stiff clay or chalk, the strata over the quarries at Godstone, are a common brown mould about three feet thick, chalk about one foot thick, a greenish mould about two feet thick, hard rocky quarry-stone or *freeze* about fifteen inches thick, and then the free-stone, which constitutes a very thick stratum, tho' the quarry-men never work in it but about five feet eight inches, as they say it grows harder, and is not so good beyond that depth. These strata shelve or incline (according to the computation of the quarry-men, and their rule of working) two feet in every rod, and head to the south, to which point they always open the quarry, and dig northward. In these quarries about four feet and a half deep, in the stratum of stone runs a vein or thin layer, four inches thick, of a hard quarry stone, or *freeze*, which they vulgarly call *flint*, hereafter to be described; it also sometimes lies only in dispersed masses in the stone; this vein or layer of rockstone, is not found in the Chaldon quarries, but in the quarries at Gatton it is again found, where it runs quite through the middle of the freestone stratum. The perpendicular fissures, which are by the quarry-men called *vents*, are very irregular both in regard to their distances and breadths; they run somewhat obliquely, and mostly dip east and west, but some few dip also north and south, and are generally empty or quite free from any fossil substance. Horizontal fissures, which they call *beds*, are seldom met with but where the stratum is very full of perpendicular fissures.

Few fossils are found imbedded in the stratum of free-stone; they are mostly small pieces of rotten wood, some few small *Glossopetræ*, and a small kind of cordated *Echinites* (never the shell itself, but only casts of it of freestone) some few *Belemnites*, flinty nodules, and echinated irony *Pyritæ*. The sides of the stone in the fissures are also often incruusted for a great extent, with a fine yellow

trigonal

trigonal spar: and the old deserted quarries have frequently very small *Stalactitæ*, of a fine white grained spar hanging from their roofs.

The Chaldon quarries are commonly opened to the north, as the stratum of freestone there runs north east, and the fissures of those quarries run generally south west.

The quarry-men, as has been already observed, never dig in the freestone, or work it, but between five or six feet deep, as the stratum beyond that depth grows harder and not so good; under it, other rockier strata are found, which they call *freezes* and *bur-stones*; these under strata are very remarkable, in that their surfaces are not always on an even plane, but very often penetrate some inches deep into one another, and then exactly resemble a parapet work.

This stone does not bear the weather, and is therefore unfit for building; but it abides the fire exceeding well, and is an excellent stone for kilns, glass-houses, furnaces, &c. and great quantities of it are brought to London; it is also used for bottoms of ovens, hearths, coverings of chimneys, &c.

Scheuchzer, Oryct. Helv. p. 108 and 115. mentions a soft free-stone which is easy to work, and abides the fire well, but does not bear the weather, and is therefore unfit for building; the quarries of it are near the village Herzli-berg, on the Zurich sea, and also at Reapfnach, and near the Stampfenbach by Zurich; it very probably is this species of freestone.

Imperat. Hist. Nat. l. xxv. c. 8. describes a sand-stone, which he calls *Pyrimacha*; it is of a fine grain, cuts free, but will not take any polish, and abides the fire well; it is used in Italy in the glass-houses, or wherever a strong fire is required; he also, *ibid.* describes another sand-stone he calls *Pietra de Coral-lari*, little different from the *Pyrimacha*, and which is chiefly used for the polishing of coral, both which described stones are likely of this same species.

III. *Saxum arenarium, griseo-albidum.*

Psadurium hebes, albedo-gryseum, fragile. Hill's Hist. Foss. p. 433. N°. 2.

A coarse rough stone, of a lax irregular texture, of a greyish white colour, considerably heavy and hard, and is composed of a large angular grit, cemented together by a terrene spar; it slightly colours the hands, and cuts freely, but is perfectly dull and destitute of splendor.

It will not easily strike fire with a steel.

It burns to a very pale flesh colour.

It is dug in many counties of the kingdom, and as it bears the weather well, is frequently used in building.

Hill informs us, that this stone generally lies deep and under other strata of stone, and is seldom found containing shells.

IV. *Saxum*

IV. *Saxum arenarium cinereum Suecicum.*

Cos friabilis, particulis argilloso-glareosis. Werckstein. Linnæus's Syft. Nat. p. 147. N°. 1. *Museum Tefsinianum*, p. 2. N°. 1.

Cos particulis minimis glareosis, mollis, cædua, Quadrum Cæfalpini, Quadratum Alberti, Saxi alterum genus agricolæ. Wallerius's Mineralogy, Species 76.

Saxum arenarium cinereum Gothlandicum. Leopold de Itin. suo Suecico, p. 23. Bromel, Mineral. Suecana, cap. vi.

Worm. Mus. p. 37.

This is of a greyish colour, of a fine small grit, cemented together by a calcareous clay, intermixed with numerous small spangles of mica; it is hard and light, cuts freely, and bears the injuries of the weather to admiration.

It will not strike fire with a steel.

It is dug at Burfviken in South Gothland, and is esteemed the finest free-stone in Sweden.

It is greatly used in building; the royal buildings at Stockholm are of this stone; it is also greatly used for columns, statues, tomb-stones, and other stone works. Wallerius mentions a free-stone which he joins to this species, dug in quarries at Kumbla, in the Province of Nericia in Sweden, which is naturally found formed into blocks or masses of an oblong cubic shape, as if it had been wrought by art; which form perhaps that stone affects, says he, from its being cemented by the species of clay, which always breaks into cubes, and is therefore called *Argilla tessulata figulina*, or else the stone and its clayey cement both concur to produce this effect.

V. *Saxum arenarium cinereum Purbecense.*

Woodw. Cat. A. b. 20.

Pfadurium friabile albido fuscum. Hill's Hist. Foss. p. 437. N°. 6.

This is a harsh rough stone, of a disagreeable ashen colour, very heavy, and moderately hard, of a texture not very compact, but somewhat porous, and is composed of an angular grit, cemented together by an earthy spar; it cuts freely and with a tolerable even or smooth surface, but will not take a polish.

It will not strike fire with a steel.

It burns to a white colour.

The quarries of this stone are in the island of Purbeck in Dorsetshire, from whence it is brought to London in great quantities, and is used in building and for pavements.

VI. *Saxum arenarium porosum Italicum.*

Teuertino. Imperat. Hist. Nat. l. xxv. c. 8.

This is a very remarkable species of sand-stone; it is coarse and harsh, of a disagreeable ashen colour, with an admixture of greenishness, and of a very porous

porous and irregular texture; tho' firm and very hard, the grit is extremely small, hardly perceivable, and angular, and is cemented together by a very earthy sparry substance, spots of a brownish matter, large flakes of a glittering blackish mica, small spangles of a silvery mica, and some few small pieces of an opake white spar are also intermixed with the stone in no small quantity: it cuts pretty freely, but always carries a rugged uneven surface, and water poured on it does not pervade it.

It strikes fire with steel.

Burnt, it becomes friable, and acquires a pale reddish brown colour.

It is dug in several parts of Italy, and is used in building, it bearing the weather well.

It is generally called in Italy, *Pietra Tiburtina di Roma*, or *il Teuertino*; it is also sometimes called *il Piperino di Roma*; but it is not, however, to be confounded with the *Piperno* described by the same author, *Ibid.* which, tho' of this same genus of stone, is by his description a quite different species.

The said author *l. c.* describes another kind of sand-stone, he calls it *Pietra Casertana*; which, says he, is of a like texture with the *Teuertino*, but its pores are smaller and not so conspicuous; it is a fit stone for sculpture, but it will not bear a polish; the said stone is also probably of this species.

VII. *Saxum arenarium granulis rotundis, Hammites dictum.*

Hammites. Plinii Hist. Nat. l. xxxvii. c. 10.

Ketton-stone. Woodw. Cat. A. b. 14. et Cat. B. n. 104. Hook's Micrographia, p. 93.

Psadurium friabile, granulis rotundis. Hill's Hist. Foss. p. 438. N^o. 7.

This is a free-stone of a pale brown colour, very heavy, moderately hard, of a lax spongy texture, and is composed of small round granules laid close together, and cemented by an earthy sparry matter; it cuts freely, and with a tolerable smooth surface, but will bear no polish,

The granules or grit of this stone, are all true small *Stalagmitæ*, or bodies of a crustated structure, being composed of coats or crusts, including one another.

It will not strike fire with steel.

It burns to a dull white colour, and becomes very friable.

The quarries of it are at Ketton in Rutlandshire; Dr. Woodward also found it in a quarry near Nunnington in Yorkshire.

It is a fine free-stone, and is greatly used in building, particularly several of the colleges at Cambridge are built with this stone.

Pliny's account of the *Hammites* is somewhat unintelligible, and has not a little puzzled some writers on fossils. That antient author's words are, *Hammites ovis piscium similis est, et alia velut nitro composita, prædura alioquin.* Gesner (1) thinks the text is corrupted, and that if the words, *et alia velut nitro composita*, were omitted, and these other words, *et tota velut arenis composita*, substituted in their stead, the description of the *Hammites* would be very correct and clear,

(1) De fig. Lap. p. 71.

and entirely answer the etymology of its name *Hammites*, which is from *ἄμμος* sand.

On the contrary, De Laet says (2) Gesner is mistaken in his criticism on Pliny's text. Pliny, continues he, (for the text is entirely the same in all the copies extant of that ancient author) plainly describes two species of *Hammites*, like the spawn of fish; one kind composed as it were of granules of sand, the other kind composed of a substance which resembles nitre; Agricola also observes, that the *Ammonites* is so composed of granules of sand, as to appear to the view like the spawn of fish; but it is also sometimes found in substance and colour like to nitre, which plainly elucidates the text of Pliny, and proves it to be right.

As Pliny gave the name of *Hammites* to a substance, which was of a granulated texture, and resembled the spawn of fish, later authors have, without any distinction, given the same name to all substances of a like granulated texture, and by that means have confounded numbers of very different species, even bodies of different genus's, by that one single name; few authors being without a description of the *Hammites*, and but very few describing the true species.

The erroneous system of Dr. Woodward (3), that the *Hammites*, composed usually of multitudes of small globular bodies, is wholly made up of a *congeries* of the *vesiculæ* of the *ova* of various kinds of *fishes*, filled with a fine hard arenaceous substance, has been very industriously propagated by many later authors. Scheuchzer (4) ranks all the *Hammitæ* among the parts of fish which are found fossil, or are remains of the deluge. Butners (5), Bayer (6), Wolckman (7), and many others, and latterly Bruckmann (8), all adhere firmly to this system; and even pretend to have discovered, by the help of microscopes, the very shells and other parts (9) of the spawn of fish in these *Hammitæ*; they further even pretend by their arguments to prove the possibility of this system, against the objections of the vast quantities and even strata of *Hammitæ* being found in different parts of the world; and which cannot be supposed to be only a congeries of the spawn of fish; and also the other chief objection of the nature of spawn, being incapable of petrification.

The *Cenchrites*, the *Meconites*, and the *Sinepites* of authors, so named from the bigness of their grit, equal to millet, poppy, or mustard seeds, are all only different varieties of granulated sand-stones.

(2) De Gem. et Lap. c. xxi. p. 145.

(3) Meth. of Foss. Letter ii. p. 19. et Cat. of Foss. B. n. 104.

(4) Mus. Diluv. p. 105. Oryctogr. Helv. p. 335. et Schweitzer Natur. Geschicht, part i. p. 106.

(5) Rudera Diluvii Testes, p. 244. § 146. et seq.

(6) Oryctogr. Norica, p. 67.

(7) Silesia Subterranea, p. 156. et p. 168.

(8) Specimen Physicum sistens Historiam Naturalem Oolithi s. Ovariorum Piscium et Concharum in Saxa mutatarum.

(9) Bruckmann per microscopium examinavit, et cortices albumen et vitellum conspexit et delineavit, fig ix. The other authors also pretend to have observed the same.

Vast strata of *Hammites* are found in several parts of the world. Scheuchzer (10) informs us of whole mountains of it in Switzerland, and (11) that in the territory of Neuenberg the houses are all built of a yellowish *Hammites*, which has glittering particles mixed with it, and which probably is this species, or a variety of it; Leopold (12) mentions a very friable kind of a ferruginous colour, the grit of which is of the bigness of a poppy seed, to be found plentifully in the province of Angermannia in Sweden; and Bruckman (13) says, there are vast quarries of this stone, of several kinds, at and near Weferling, a small town in the duchy of Halberstadt, as also on the Nufzberg near Brunswick, in which city St. Andrew's church, a most sumptuous structure, is entirely built of *Hammites*, and even the streets are also paved with the same stone.

The last quoted author, in his Natural History of the Oolithi, describes and figures a very particular and remarkable species of *Hammites*, which is found at Hamersleben, in the duchy of Halberstadt; it is not composed of round granules, like the common *Hammitæ*, says that author, but of triangular granules, whose tops all tend towards a central point.

VIII. *Saxum arenarium durum rubescens.*

This is a very hard and heavy stone, of a dull brownish red colour, of a strong compact firm texture, and is composed of a very small angular grit, extremely closely laid, and cemented together by a fine sparry matter; it cuts free and smooth, but does not bear any considerable polish.

It strikes fire readily with steel.

It burns to a deeper colour, and becomes so very friable as readily to crumble between the fingers.

This stone is dug in Warwickshire, and is the common building stone of that county, particularly about Coventry, in which city the tower and spire of one of the large churches are entirely built of it.

IX. *Saxum arenarium rubro-fuscum.*

Psadurium durius, rubrum, scintillans. Hill's Hist. Foss. p. 441. N°. 5.

A coarse rough stone, of a deep reddish brown colour, very hard and heavy, of a very close firm texture, and is composed of a large angular grit, cemented together by a sparry matter of the same colour, intermixed with numerous glittering spangles of white talc; it cuts very difficultly, and is capable of a tolerable polish.

It will not easily strike fire with steel.

Burnt, it suffers little change.

It is dug in Norway, from whence it is brought to us in great quantity, and is used in pavements.

(10) Schweitzer Natur-Geschicht, l. c.

(11) Oryctogr. Helvetica, p. 113.

(12) De Itinere suo Suecico, p. 71.

(13) Hist. Nat. Oolithi, p. 23. et Thesaurus Subterraneus Ducatus Brunswigii, p. 127, et seq.

S E C T. II.

Sand stones which are not acted upon by acids.

X. *Saxum arenarium album venis nigris variegatum.*

THIS is an exceeding fine sand-stone, and bears so even and smooth a surface, as nearly to approach a polish; it is of a fine white colour, elegantly variegated with veins of a black coal like substance, of a firm compact texture, moderately heavy and hard, and is composed of an exceeding fine small equal crystalline grit, held together by a terrene matter; it cuts freely, and water readily pervades it.

It will not strike fire with steel.

In the fire it becomes friable, but suffers little change of colour.

This free-stone forms a stratum or *measure*, in the collieries near Coalbrookdale in Shropshire; the stratum is ten feet thick, and lies about forty yards deep; the colliers vulgarly call it *The little flint roof*; this stratum is very various in different parts; in some places it is this described stone, in other parts it is not so fine, and in those places stone casts of parts of vegetables, as reeds, and impressions of the barks of trees, of the pine and fir kind, are frequently found imbedded, and in other places it is intermixed with a black friable rock, in which nodules of iron-stone are lodged.

The inhabitants of that place, very often cut it out into chimney pieces, which prove very pretty, and very little inferior to marble.

XI. *Saxum arenarium album Suecicum.*

Cos friabilis, particulis glareosis, et Cos particulis æqualibus friabilibus. Linæus's Syst. Nat. p. 147. N°. 2.

Cos particulis arenosis æqualibus, minoribus, coticularis, Lapis Cotarius, Cos vulgaris, Saxum molare Agricola, Cos gyratilis et aquaria Plinii. Wallerius's Mineralogy, Species 73.

Cos versatilis, Cos friabilis particulis glareosis duris. Mus. Tessinianum p. 4. N°. 5.

Wetzstein Bromel's Mineral. Suecana, c. 6.

This stone is composed of very fine and equal particles, but not closely united, yet so compact that water does not pervade it.

Its colour is generally white, but it is also found of an ashen, and of a reddish colour. Wallerius make four varieties of this stone from its colour, viz. 1. the white kind; 2. that of a light grey colour; 3. the reddish; and 4thly the yellowish kind.

It will not strike fire easily with steel.

It is dug in the parish of Orsa, in East Dalarlia in Sweden, where the second and third variety is particularly dug in very great quantity; this kind of stone also constitutes one of the lowest strata of the mountains in the Province of Westrogothia in the said kingdom: it is also found in Saxony.

It is used for mill-stones, whet-stones, &c.

The *Cotula* f. *Cos friabilis particulis glareosis impalpabilibus*, Mus. Tessin, p. 2. N^o. 4. which he describes to be of different colours, and not to be affected by acids, and is likewise found in the Province of Westrogothia, at Moesberg with petrifications, at Bertelsdorf, and also in Saxony, I take to be only a variety of this species.

XII. *Saxum arenarium granulis Hammitæ similibus obsitum.*

This is a very remarkable species of sand-stone, of a very dull ashen white colour, moderately hard, very heavy, and of a firm compact texture; it is composed of a small grit, closely united and cemented by a terrene crystalline matter, and is thick set throughout its substance, with round opake brown grains of the bigness of poppy seeds; these grains are independent from the substance of the stone, and freely separate from it, and wherever it is broke, always appear very protuberant on its surface, and like pimples, on which account it has obtained the name of the *Measly Pellwill* among the colliers; it does not cut freely, nor does water readily pervade it.

It will not freely strike fire with steel.

It suffers no change in the fire.

This stone forms a stratum, which lies about forty four yards deep in the collieries at Madeley, near Coalbrook-dale in Shropshire; but it is not a frequent measure.

It is made no use of.

XIII. *Saxum arenarium griseo-albidum alterum.*

This is a free-stone, of a dull greyish white colour, hard, heavy, of a very close, firm, regular texture, and is composed of a small angular grit, extremely closely united and cemented together by a terrene crystalline matter.

It strikes fire readily with steel.

It burns to a very pale reddish colour.

This free-stone is found in large strata, in the cliffs in Whiteford Parish in Flintshire, and is there much used for building.

XIV. *Saxum arenarium fusco-albidum.*

Cos portabilis, the Whet-stone. Woodw. Meth. of Foss. p. 9. N^o. 26. et Cat. A. b. 32.

Cos aquaria. Agricola de Nat. Foss. l. v. Gesner. de fig. Lap. p. 101. Aldrov. Mus. Met. p. 719. Imperat. Hist. Nat. l. xxv. c. 8. Worm. Mus. p. 41. Charlt. de Foss. p. 243. N^o. 11. Wolkm. Silesia Subt. p. 41.

Cos f. Arenarius minor. Woltersdorf Syst. Min. p. 14.

Psadurium friabile pallide fuscum. Hill's Hist. Foss. p. 440. N^o. 4.

This

This stone is of a very faint yellowish white colour, harsh and heavy, of a somewhat lax and spongy texture, and is readily friable or broken between the fingers; it is composed of an angular grit, cemented by a debased crystalline matter, intermixed with numerous small spangles of a silvery talc; it cuts free, but takes no polish, and water readily pervades it.

It will not strike fire with steel.

It burns to a reddish white colour.

It is dug chiefly in Derbyshire, and the northern counties: at Blackdown Hill, in Kentish Beer Parish in Devonshire; this stone is dug from the sides of the hill, and lies about four feet from the surface.

It is also dug in many parts of Europe.

It is greatly used for whetting of scythes, knives, &c.

The sand-stone, coarse scythe-stone, or rubber, exhibited by Woodward, Cat. A. b. 33. is only a variety of this kind.

Most of the authors who have treated on fossils, confound the grind-stone and this scythe-stone together as one kind; Hill even asserts, that the harder parts of the stratum makes the common rough whet-stones, and that the coarser parts are cut into grind-stones; but it is a great error, the grind-stone and common whet or scythe-stone, tho' they agree in many particulars, yet they are two very different species of sand-stone.

XV. *Saxum arenarium cinereum alterum.*

Cos particulis arenosis tenuissimis impalpabilibus indurabilis, Cos Turcica. Wallerius's Mineralogy, Species 72.

This stone, tho' composed of an extreme fine sand, at first sight appears of a solid compact texture like a flint, and flakey; it is of a grey colour, not hard, but easily worn down by iron, while dry, but when moistened with oil, it becomes very hard.

Calcined, it becomes harder, and of a whitish colour.

Imperat. Hist. Nat. l. xxv. c. 8. describes a kind of oil sand-stone, which he calls *la Zuccherina*. It is whitish, says that author, breaks like sugar, and is, like that substance, somewhat transparent, and does not give a very fine edge to tools; probably it is a variety of this species.

XVI. *Saxum arenarium friabile fusco-cinereum.*

This is a very coarse harsh stone, of a pale brownish grey colour, of a very lax and porous texture, and easily broken between the fingers; it is moderately heavy, and is composed of a large angular grit, cemented by a loose earthy crystalline matter, and has numerous spangles of a silvery talc; it cuts freely, but will not take a polish, and water easily pervades it.

It gives fire freely with steel.

It burns to a deep brown colour.

This stone is dug in many counties of the kingdom, but I do not know that it is used in building, or indeed for any other use.

Smith's

Smith's Nat. and Civil History of the county of Cork, vol. ii. p. 371. mentions this stone, and says, it is a species of what is called in Dublin *Fire-stone*, being very frequent in that county, and of late years greatly introduced in that city for building, so as in some measure to supply the place of Portland stone.

This seems to be the *Pseudurium friabile e flavo subsuscum, scintillans*. Hill's Hist. Foss. p. 440. N^o. 2. for it answers to it in several particulars, but differs from it in that this is not at all acted upon by acids, and readily strikes fire with steel.

XVII. *Saxum arenarium cinereum, Filtrum dictum.*

Cos particulis arenosis majoribus, aquam transmittens, Filtrum. Wallerius's Mineralogy, Spec. 74.

Cos solidiuscula porosa, aquam sensim transmittendo stillans, Cos aquam transmittens. Linnæus's Syst. Nat. p. 148. N^o. 8.

Filtrum, Lapis Mexicanus. Valentin Aurifod. Med. p. 45. Bromel Mineral. Suecana, c. vi. Woltersdorf Syst. Min. p. 14.

This is of a dark grey colour, rugged, harsh, of a lax spongy texture, and easily broken between the fingers; it is composed of very gross tho' equal particles of sand, coarsely concreted together, and cemented by a terrene and debased crystalline matter.

It is found in the Canary islands; and in some places of the Gulph of Mexico there are rocks of it, which lie very deep in the sea. The Spaniards, at a great expence, transport the largest masses of it to the South Sea, and there embark them for China and Japan, where these large masses are so highly valued, that it is said they are sold for their weight in gold.

The principal use of this stone, is to filtre and depurate water, to render it fit for drinking.

The Japanese carve this stone into jars, and other vessels, to filtre and depurate their water; for tho' the water to all appearance be extremely fine and clear, yet it always deposits some imperceptible dregs by being filtered through this stone; it is for that reason, that the noblemen and rich people of Japan, who can afford to purchase these filtering stones, are said to be free from the gravel and other like disorders.

XVIII. *Saxum arenarium, Tophus dictum.*

Tophus v. Tophus, s. Porus. Plin. Hist. Nat. l. xvii. c. 4. Columella l. iv. Kentm. Nom. Foss. p. 37. Gesner De fig. Lap. p. 32. Scaliger De Subtilit. Exercit. 57. Imperat. Hist. Nat. l. xxv. c. 8. Kircher Mund. Subt. l. viii. § 1. c. 9. p. 87. De Laet de Gemm. et Lap. c. xii. p. 130. Worm. Mus. p. 48. Lachmund Oryctogr. Hildesheimensis, p. 10. Mercat. Met. Vat. p. 152. Wolkm. Silesia Subter. p. 44. Bayer Oryctogr. Norica, p. 24. Bruckm. Thes. Subt. Duc. Brunswicensis, Cab. 16. p. 95. Woltersdorf Syst. Min. p. 20.

This

This species of sand-stone is mostly of a grey colour, but it is also found of other colours, as whitish, brownish, &c. according to the soil in which it is imbedded.

In texture it greatly resembles the *Pumice*, being full of cavities and very light; it is rugged, rough, and brittle, being easily crumbled into powder, and is composed of a large angular grit, cemented by a very coarse terrene crystalline substance.

It is too soft to strike fire with steel.

In England it has not as yet been found, but it is very common in most parts of Italy and Germany; in the neighbourhood of the city of Andernach, on the Rhine, there are vast rocks of it of a brownish grey colour.

The name of *Tophus* occurs frequently in several late authors, but they confound this species of sand-stone with the incrustations frequent on the banks, and in the beds of rivers and springs; they have applied this name of *Tophus* to all those incrustations, and by that error have caused an inextricable confusion in the natural history of this stone, for it has not the least affinity to those incrustations, but is a particular species of sand-stone, and was well known as such to the ancients, the Greeks calling it *Porus*, and the Romans *Tophus*.

Another error among authors, is the confounding this sand-stone with the *Porus marble* of Pliny, l. xxxvi. c. 17. on account of the name; but the *Porus marble* (now unknown) is described to be of the same colour and hardness as the *Parian marble*, but remarkable for its lightness, in which it resembled the *Porus*, and from which property it obtained its name of *Porus marble*.

The *Tophus* is greatly used all over Germany, in building, chiefly for cellars; it is an excellent stone to turn arches with, as by its lightness it does not press on the building, and by its porosity it is easily cemented with mortar; by which means the arches have the two excellencies of being excessive light, tenacious and strong, at the same time. The Romans, for the same reasons, in all their great buildings, used to turn their arches with the pumices of Mount Vesuvius, as is yet to be seen, particularly in the *Thermæ Antonianæ*, or the baths of Caracalla at Rome; and the Neapolitans, as I informed, do the same to this day.

The *Lapis cribriformis* or sieve-stone, of Grew's Mus. Reg. Soc. p. 305. which he describes as a kind of *Tophus*, of a brown colour, porous, light and friable as a pumice, and perforated with many pores more conspicuous, about as big as to admit a large pin, and regular, *sc.* round, strait and fistular, is a variety of this stone, as is also the *Lapis bibulus* of Mercator, l. c. which is sandy like the *Tophus*, more friable and dryer, and from its sucking up water, so named by him.

The *Cemento Sorrentino*, and the *Cemento Campano* of Imperatus, Hist. Nat. l. xxv. c. 8. which he describes to be of the *Tophus* kind, and greatly used in building, are both to be referred to this species of stone.

XIX. *Saxum arenarium Lapis molaris dictum.**The Mill-stone.*

Lapis Molaris f. *Molæ*. Aldrov. Mus. Met. p. 721. Imperat. Hist. Nat. l. xxv. c. 8. Schwenckf. Cat. Foss. Silesiæ, p. 392. Worm. Mus. p. 41. Charlt. de Foss. p. 243. N°. 10. Merret's Pin. Rer. Nat. Hist. p. 212. Bayer's Oryctogr. Norica, p. 24. Leopold de Itin. suo Suecico, p. 4, 5, et 72. Woodw. Meth. of Foss. p. 9. N°. 24. Dale's Pharm. p. 48. Bruckm. Epist. Itin. Cent. 2. Ep. 11. p. 92. et Tab. 11. Fig. 6.

Cos molaris. Mus. Tessin. p. 4. N°. 10.

Cos solidiuscula, particulis arenaceis quartzosis inæqualibus. Linnæus's Syst. Nat. p. 148. N°. 6.

Cos particulis majoribus, sabulosis, diversæ naturæ coalita, Cos sabulosa, Saxum glareosum. Wallerius's Mineral. Species 79.

This stone is of a very irregular texture, it being an assemblage or composition of particles of coarse sand and gravel, bits of spar, flint, micæ, &c. all concreted and cemented together by a coarse terrene crystalline substance.

It is very hard and heavy, and is found of different colours, chiefly of a greyish brown, also of a brown, a red, a yellowish and an ashen colour.

The varieties of this stone are many (for the different colours, and the compositions of it, can be justly ranged no otherwise, than as varieties) which however may be reduced to three principal sorts, viz. 1. The above described; 2. That sort which is mixed only with fragments of flints and with pebbles; and 3. That mixed with great quantities of talc and garnets. The first variety is the kind commonly dug in England; the second variety is chiefly found in Sweden, in the bishoprick of Hildesheim, in the Nuremberg territories, and some other parts of Germany; and the third variety is principally found in Norway.

Mill-stones are also dug in most other parts of Europe.

According to the various substances concreted together in this stone, in some parts it effervesces strongly with acids, in other parts of the stone it is not at all acted upon by those menstrua.

In like manner it sometimes is of so hard a texture, as to readily strike fire with steel, while at other times it is too soft to strike fire; and by burning, it also suffers different changes.

Wallerius makes a different species of stone of the second variety, which he synonyms species 171. *Saxum petrosum arenaceo-siliceum*, f. *Saxum petrosum arenaceum*, tho' at the same time he says it is only a variety of the mill-stone; and in his description of that stone, has placed it as such, by the name of *Cos arenacea particulis siliceis mixta, Saxum petrosum arenaceum*.

It is chiefly used for mill-stones, tho' Schwenckfelt informs us, that in Silesia it is also used in building, as it bears the weather well.

XX. *Saxum arenarium durum cinereo-fuscum.*

This is a fine free-stone of a dingy ashen brown colour, or like to that of a sullied fullers earth, hard, heavy, of a coarse firm regular texture, of an exceeding small angular grit, closely cemented by a coarse earthy crystalline matter, and is intermixed with some few glittering spangles of talc; it cuts freely, and bears a smooth surface.

It readily strikes fire with steel.

It burns to a very deep reddish brown colour.

This stone is dug in a quarry near Trelacre in Flintshire; it there constitutes a vast stratum, and is divided by perpendicular fissures, at great distances from each other, and forms large stacks.

XXI. *Saxum arenarium flavo-fuscum friabile.*

This is a very coarse sand-stone, exactly of the colour of fullers earth, of a very lax texture, and readily breaks between the fingers, it is moderately heavy, and is composed of an angular grit, held together by an earthy substance; it cuts freely, but will not bear an even surface.

It is too soft to strike fire with steel.

It burns to a bright red colour, and acquires a great hardness.

This sand-stone constitutes a stratum generally about four feet thick, sometimes much thicker, just under the turf or soil, and over the stratum of fullers earth, at Reygate, Nutfield, and the adjacent places in Surry, and always rises in large flattish masses; it frets and wears away so much in the weather, that the inhabitants there make no other use of it than for the lower stones of out-houses, and such like buildings.

XXII. *Saxum arenarium flavo-fuscum, Cos gyratilis dictum.*

Cos Aquaria, f. Aquaticus. Agricola de Nat. Foss. l. v. Aldrov. Mus. Met. p. 719. Kentm. Nom. Foss. p. 36. N°. 2. Gesner de fig. Lap. p. 101. Imperat. Hist. Nat. l. xxv. c. 8. Schwenckf. Cat. Foss. Silesiæ, p. 375. Worm. Mus. p. 41. Charlt. de Foss. p. 244. N°. 11. Wolckm. Silesia Subt. p. 41.

Cos gyratilis, the Grind-stone. Woodw. Meth. of Foss. p. 9. N°. 25. et Cat. A. b. 30.

This is a very coarse, rugged, rough and harsh stone, of a yellowish brown colour, moderately heavy, of a spongy and lax texture, so as easily to be broken between the fingers, when in small pieces; it is composed of an irregular grit cemented together by a coarse and debased terrene crystalline matter, and intermixed with a very few glittering spangles of white talc; it cuts freely, but will not bear any polish, and water poured on it, readily pervades it.

It will not strike fire with steel.

It burns to a deep red colour, but acquires no hardness.

This

This kind of stone is dug particularly in the northern counties of England. It is chiefly used for grind-stones.

The error of authors, in confounding this stone with the common scythe or whet-stone, has been already observed in the description of that stone.

XXIII. *Saxum arenarium durius rubrum.*

Pfadium durius rubrum. Smith's Nat. and Civ. Hist. of the county of Cork, vol. ii. p. 370.

This is a coarse, rough stone, of a very firm and close texture, not glittering with spangles, nor will it take a polish; it is remarkably hard, and ponderous, and of a Spanish brown colour. It is cut with difficulty, flying from the tools in irregular chips, is very strong and bears the weather well, and contains iron in its substance.

It scarce suffers any change in the fire.

This stone lies in immense strata; for on the north side of the city of Cork in Ireland, it may be seen from twenty to forty feet thick, divided in many places both by perpendicular and horizontal cracks, and it is also found to extend through several baronies of that county, where it gives the name of red-stone-ground to the soil.

There are several quarries of it worked near Cork, the south goal of which city is mostly built with it.

XXIV. *Saxum arenarium friabile rubrum.*

This is a heavy, coarse, and harsh stone, of a deep brownish red colour, of a spongy lax and friable texture; it is composed of a small roundish crystalline grit, held together by a ferrugineous earth; it cuts freely, but does not bear any polish.

This stone, which contains iron in its substance, is also often pervaded with hard blackish ferrugineous veins running in all directions.

It will not easily strike fire with steel.

It burns to a very pale brown colour, and becomes friable.

All the cliff near the end of Nuckin Heath, next to Shrewsbury, is formed of this stone, and it is sometimes used in those parts for building.

This seems to be the *Pfadium friabile, ferrugineum*, Hill's Hist. Foss. p. 442. N^o. 6. which, that author says, is common in most counties of England.

XXV. *Saxum arenarium ferruginei coloris.*

Pfadium durissimum, ferrugineum, scintillans. Hill's Hist. Foss. p. 441. N^o. 6.

This stone, which might be worked for an iron ore, is generally of the colour of rusty iron, very hard and heavy, of a firm compact texture, and is

composed of a small roundish crystalline grit, cemented together by a brown terrene ferrugineous matter, and intermixed with many spangles of a white foliaceous talc; it cuts difficultly, but bears a tolerable polish.

It will not easily strike fire with steel.

It burns to a deep chocolate colour.

It is found in many parts of England, but no where so plentifully as about Bristol: it generally lies in immense strata, and is also often found in nodules, or disjointed pieces.

It bears the weather well, and is used in some places in building.

Woodward Cat. c. b. 4. exhibits a pale brown stone holding iron, of which there is a stratum near a foot thick, extending for several miles, and lying above the shells in Hordell Cliff, betwixt Limington and Christ Church, in Hampshire, which probably may be this species of stone.

XXVI. *Saxum arenarium pallide purpureum.*

This is of a pale purple colour, and is generally composed of parallel veins of a pale purple, and a pale whitish purple colour, like so many different strata, in a very regular manner; it is heavy, moderately hard, of a firm compact texture, and is composed of a small angular grit, cemented by a debased crystalline matter, intermixed with some small spangles of a silvery talc; it cuts freely, and bears an even surface, but no polish, and water readily pervades it.

It will not strike fire with steel.

It suffers no change in the fire.

There is a large stratum of this stone, near the sea side in Whiteford Parish in Flintshire, but it is not, that I know of, put to any use.

Fragments of this stone, broken off from the stratum, and rolled to and fro by the sea, till they are rounded and worn smooth like nodules or pebbles, are frequent on the shore there.

XXVII. *Saxum arenarium.*

Cos particulis arenosis, inaequalibus, dura vulgaris, Arenarius, Lapis arenarius. Wallerius's Mineralogy, Species 77.

Cos solidiuscula, particulis arenaceis quartzosis subopacis subaequalibus, Cos particulis inaequalibus rigidis. Linnæus's Syst. Nat. p. 148. N°. 5.

Cos fundamentalis. Mus. Teyn. p. 4. N°. 9.

Saxi arenarii. 1. Gen. Worm. Mus. p. 37.

Saxi arenarii. 2. Gen. Schwenckf. Cat. Foss. Silesiæ, p. 392.

Bromel's Mineral. Suecana, c. 6.

This stone is composed of very unequal and coarse particles, like the grindstone, but is much harder and more compact than that stone, and is difficultly cut.

There are several varieties of it, viz. 1. of a white colour; 2. of a yellowish colour,

colour, this sometimes borders upon a red colour; and 3. of a grey colour: Wormius also reckons a blackish sort, with spangles of a golden talc.

It will not strike fire with steel.

This stone is dug in great quantities in Sweden, particularly at Rodmansö, in the Province of Roslagen, and on account of the quantity got from thence, it is generally called in that kingdom, *The Roslagen stone*; it is also found near the lake Wetter.

It is likewise dug in several parts of Silesia.

In that kingdom and in Silesia it is greatly used in building, chiefly for laying the foundations of houses, and for various other stone works, especially in marshy places.

XXVIII. *Saxum arenarium Suecicum.*

Cos solida, particulis quartzosis impalpabilibus. Linnæus's Syft. Nat. p. 147. N°. 3. Mus. Tessin. p. 4. N°. 7.

This is sometimes of a glassy colour, sometimes white and flesh coloured, it is hard, and generally composed of red granulated particles, hardly visible to the naked eye.

It strikes fire freely with steel.

It is found at Malung, in the Province of Dalcarlia, and in the precipices at Hall, and also at Hunneberg, in the Province of Westrogothia in Sweden.

XXIX. *Saxum arenarium foraminosum.*

Cos particulis arenosis, minoribus, variis foraminulis inordinatè distincta, Cos foraminata. Wallerius Mineralogy, Species 75.

This stone appears as if it had been worm-eaten, and greatly resembles a pumice; the particles which compose it are very fine, it is a little flaked, is very light, cuts freely, and water readily pervades it.

There are quarries of it in the Province of Ingermania in Sweden; the Palace of Petershoff is built of this stone.

Stones of this kind are also found in the neighbourhood of Upsal, but the particles of these are coarser or grosser; they are found on the sand hills and downs; exteriorly they seem as if corroded by the air, and are only found in small detached peices or nodules.

Linnæus's Iter. Scan. p. 13. and the Mus. Tessin. p. 4. N°. 6. exhibit a sand-stone which they synonym *Cos variolosa*, *f. Cos friabilis, particulis arenaceis æqualibus, aquam transmittens, Cos solidiuscula alba, cortice flavescente, maculis fuscis friabilibus.* Those authors describe it to be very friable, and of a lax texture, of a white colour with brown spots and cavities, and greatly imbibing water; it is found in the Provinces of Nericia and Westrogothia, in Sweden, the said stone is probably only a variety of this species.

S E C T. III.

Sand-stones imperfectly described by authors.

XXX. *Saxum arenarium Italicum Piperno dicto.*

PIPERNO. Imperat. Hist. Nat. l. xxv. c. 8.

This kind of stone is of a clear grey colour, variegated with veins of a darker colour, which are harder than the rest of the stone, and a little flinty, and when worked strike fire, the rest of the stone is soft, spongy, and somewhat like a pumice.

It is found in Italy, and is used for the corners, carvings, and other ornaments in building.

XXXI. *Saxum arenarium Italicum Puzzolano dictum.*

Sasso Puzzolano. Imperat. Hist. Nat. l. xxv. c. 8.

This kind of stone is of a dark grey colour, not spotted or veined, but of an uniform substance like a calcined flint, and not visibly spongy.

It is found in Italy, and is used for corner stones, pillar work, and other ornaments in building, and is more esteemed than the *Piperno*, it being of a more uniform and firm texture, tho' it does not bind so well with mortar as that stone.

XXXII. *Saxum arenarium tertium.*

Woodw. Cat. A. b. 31.

Stone of a pretty harsh grit, of a grey colour, with a cast of red, having several micæ of white talc in it.

It is found at Whitehaven in Cumberland.

It is made use of there for building; as also for grind-stones.

It abides fire very well; and therefore is likewise employed for the building of the insides of the cupuloes for running of copper there.

The said author, Cat. E. b. 4 et 5. likewise exhibits the following stone, which probably is of this species, viz. Free-stone composed of white and brown sand, with an intermixture of small silvery micæ. It is got near Newcastle. 'Tis used for building, and also for glass furnaces. It abides the fire well, if kept constantly hot, but cracks when the fire goes out. This stone, when impaired by the force of the fire, they grind down to powder, and mixing it with Sturbridge clay, employ it for making the stands or rests on which they place the pots in which they melt glass.

Grew, Mus. Reg. Soc. p. 318. exhibits two sand-stones, probably also referable to this species; a gritty stone, says that author, from the forest of Dean; with which they there make the insides of their iron furnaces; wherein their fire is so vehement, that it either breaks or melts down any other material.

It is not a compact stone, but is somewhat soft and crumbly, and of a dirty colour, near that of fullers earth. The other sort is more gritty, harder, and of a brown colour.

XXXIII. *Saxum arenarium cinereo-fuscum Italicum.*

Macigno. Imperat. l. xxv. c. 8.

This species of sand-stone is composed of minute equal granules, and is of a pretty compact and firm texture, of a greyish brown colour, with an admixture of greenishness, and somewhat resembles emery, and is spangled with small micæ; it cuts freely, but will not bear a polish.

It is esteemed a good stone for sculpture, and is used for the carved works in building, but as it does not at all abide the weather, it is seldom used but in the insides of buildings; it is also used for the polishing of marble, and sometimes for whet-stones.

S E R I E S II.

C H A P. I. G E N U S II.

Stones harsh and rough, composed of a visible grit, of a laminated structure, and splitting only horizontally or into plates.

S E C T. I.

Alcaline flags or laminated sand-stones.

I. *Saxum arenarium fissile cinereum.*

AMMOSCHISTUM friabile, Griseum hebes. Hill's Hist. Foss. p. 443. N^o. I.

This is a coarse rugged stone, of a very disagreeable ashen colour, and perfectly destitute of any brightness; it is rather light than heavy, and is easily friable between the fingers; it is composed of an irregular grit, pretty closely cemented together, by a very coarse debased sparry matter.

The laminæ are always very visible and are thin and numerous, sometimes not exceeding the thickness of brown paper; so that in a piece of half an inch thick, seven or eight perfect laminæ are often discernible.

It will not strike fire with steel.

Burnt, it becomes extremely friable, and of a white colour.

It is dug in several parts of this kingdom, and is frequently used to cover houses instead of tiles; but is very unfit for that purpose, as it bears the weather but badly, and is apt to crumble after frosts.

II. *Saxum arenarium fissile, pallide fuscum.*

This is a rough, dusty, harsh, and rugged stone, of a pale disagreeable ashen brown colour, and quite destitute of any brightness; it is hard, heavy, of a compact firm texture, and is composed of a small irregular grit, closely cemented by a coarse terrene spar.

It will not strike fire with steel.

Burnt it becomes very friable, but suffers no change of colour.

There are quarries of it at Burford in Oxfordshire, where it is used to slate houses, for pavements, &c.

III. *Saxum arenarium fissile scintillans pallide fuscum.*

White slate, or flag, so called in the north. Woodw. Cat. A. b. 85—

Ammoschistum scintillans, albido fuscum, p. 444. N^o. I.

The most general colour of this species is pale brown, but it is also found of a whitish, of a grey, and of an ashen colour, all which varieties, nevertheless, are called by the one common name of *White-flag*.

It

It is a heavy hard stone, very bright and glittering, being always thick set with spangles of white talc, of a firm compact texture, and water poured on it, slowly pervades its structure; its grit is angular, and is cemented by an earthy spar.

It will not easily strike fire with steel; and burnt, it acquires a greyish white colour.

It is a very common stone in the northern counties of England.

This sort is every where flat, and in layers of about half an inch in thickness, for perhaps ten or twelve feet in perpendicular: but generally the uppermost strata are the thinnest; those that lie deeper gradually increasing in thickness, till at last they are so thick as not to serve for slates. The thicker flags are used for cisterns and tanners fats, as also for pavements and floors: as they do the thinner for covering of houses. For this last purpose they use plates of this from one to four feet square. For in the earth, each flag, or stratum, keeps the same thickness in all parts, how far soever it be pursued horizontally, till the quarry terminates. They lie generally level, or a little inclining.

Woodw. Cat. C. b. 22. exhibits a grey flag, found near Aywood in Herefordshire, which, as it is thick set with silvery talc, may probably be of this species.

IV. *Saxum arenarium fissile fuscum.*

Stunsfield-slate. Plot's Oxfordsh. p. 77.

This species of flag is composed of an extremely fine small grit, cemented so very closely and firmly by a fine earthy and sparry substance, as to appear almost of an uniform solid texture, and not appertaining to this genus.

Exteriorly it is a coarse, dusty, rugged stone, but interiorly it is not quite destitute of brightness; it is of a pale brownish colour, very hard and heavy, and its flats or the surfaces of the laminæ or plates, are always thick set with small bivalves, but in it's solid substance, few or none are imbedded.

It will not readily strike fire with steel.

It burns to a browner colour.

The quarries of this flag-stone are at Stunsfield in Oxfordshire; they are worked only during the winter season, and the stone, which is dug in large masses, being laid in the open air till the summer, is rendered fissile by its long exposure to the weather, and then splits easily into plates, which are used to cover houses, and is the common slating stone in those parts.

The shells which are thick set on the flat surfaces of this stone, are generally small, and of the pectunculus genus, and numbers of other curious figured fossils, as the teeth and palates of fish called *Siliquastra*, *Bufonitæ*, *Plectronitæ*, &c. are found also lodged between the plates of this stone.

The upper stratum of these quarries is a soft gritty laminated stone, of a brownish white colour, which ferments violently with aqua fortis; it is used there as a sort of whet-stone, and is only a variety of this species.

V. *Saxum arenarium fissile, conchyliis refertum.*

Woodw. Cat. G. b. 4, 5, 6, 7, 8, 9, et 10.

This stone is nearly of a compact and uniform constitution, so as to appear not to appertain to this genus. The grit is so intimately blended with the amazing abundance of marine bodies, which not only cover the surfaces; but are equally imbedded throughout the stone; and it is also so greatly saturated, and cemented by fine sparry matter, that the gritty texture of the stone is hardly discernible.

It is of a pale whitish brown colour, very heavy and hard, and quite destitute of any splendor or brightness.

It will not strike fire with steel.

Burnt it suffers no change, the shells lodged in it excepted.

The quarries of this flag-stone are at Charlwood, in the parish of Box, about five miles distant from Bath, and about a mile from the London road; it there forms large strata to about twelve feet thick, which dip about two yards in eight; the stone lies in thin laminæ or strata one over the other, the thinnest strata uppermost; some are above an inch thick, others not a sixth part of that thickness, and all contain more or less Diluvian remains, an amazing variety: and coarse ferrugineous dendritæ are very often found on the stone.

There are strata of it also at Lansdown, and many other places about Bath, where it is used as slate for covering of houses.

VI. *Saxum arenarium fissile cæruleum.*

Ammoschistum micaceum subcæruleum. Hill's Hist. Foss. p. 446. N°. 5.

This flag is of a deep dusky lead colour, extremely heavy and hard, of a close compact texture, and very bright and glittering, with the great numbers of fine talcy particles which bespangle it on its flat surfaces, but which, like the other stones of this genus, are hardly discernible, where the stone is broke across; it is moderately fine and smooth, its plates or leaves are generally very regular and thin, not exceeding the tenth part of an inch in thickness, and cohere so firmly together, as not to be easily separated; its grit is small and irregular, and is cemented together by an earthy, sparry, and crystalline substance.

It readily strikes fire with steel.

Burnt, it acquires a reddish brown colour.

It is dug in several parts of Italy, and is much used in building.

SECT. II.

Flags which are not acted upon by acids.

VII. *Saxum arenarium fissile album micis argenteis refertum.*

THIS is a coarse, harsh, stone, of a sullied white colour, it is composed of a large irregular crystalline grit cohering loosely together, and cemented with a terrene crystalline substance; it is very bright and dazzling, with great quantities of small spangles of silver talc, which are laid extremely thick on the flat surfaces of the plates, but when the stone is broken transversely, like all other micaceous flags, the talcy spangles make scarce any figure, because their edges then are only seen, whereas when they are split flatwise, all the spangles then shew their flat surfaces, as they are always laid in a regular horizontal direction.

It is very heavy, and pretty hard, and the laminæ are generally very regular and thin; a flag of two inches thick having often fourteen or fifteen plates.

It will not strike fire with steel.

Burnt, it acquires a clearer white colour, with a very slight reddish hue, and becomes very friable.

It is dug in several parts of this kingdom, and is greatly used as slate, and for pavements, &c.

VIII. *Saxum arenarium fissile subpurpureum.*

Ammoschistum durissimum, albo purpureum. Hill's Hist. Foss. p. 445. N^o. 4.

This is an extremely bright and glittering flag, and is the hardest stone of this genus; it is generally variegated with white and purple, and oftentimes the plates are of one of these colours only; it is rough and harsh, exceeding heavy, of a firm, compact, and close texture, and thickly spangled with small micæ; its grit is fine and irregular, and is cemented together by a pure crystalline matter; this stone is obscurely and irregularly laminated, but splits easy enough, according to the commissures of the plates.

It readily strikes fire with steel; and burnt, it acquires a paler colour.

It is dug in Italy, and is much used there in pavements.

IX. *Saxum arenarium fissile micaceum fuscum.*

Saxum cotaceum rufum, lamellis convexis submicaceis. Linnæus's Syst. Nat. p. 186. N^o. 1.

This is moderately hard and heavy, of a brown colour, and composed of an irregular grit, cemented by a crystalline substance, its flat surfaces are

covered with small spangles of a silvery talc, and its laminæ are thin and numerous.

It burns to a pale purplish red colour.

It is dug in England, and is also a very common stone between Serna and Lima, in the Province of Dalekarlia in Sweden, but is not, as I know of, put to any use.

Dr. Woodw. Cat. C. b. 5, and b. 23. exhibits flag-stones of a brown colour, with small silvery micæ, found in the cliffs, on the farther side of the Severn, near Pyrton Passage; all the strata there, says the Doctor, are of this sort; but there are small cracks in several parts of them, and near the cracks the stone is rendered white by insinuation of the water; this possibly drawing off some of the ferrugineous matter, that colours the stone. And Cat. E. b. 14. he also exhibits a like stone from a quarry on Overton Hill, in Ashover Parish, Scarf-dale, in Derbyshire, all which stones are probably of this species.

S E R I E S II.

C H A P. II.

Stones found forming continued strata, of a close, solid, smooth texture, or composed of no visible grit, and generally destitute of brightness, tho' in some degree capable of a polish.

G E N U S I.

Stones of a close, solid texture, of a plain uniform structure, and splitting with equal ease in any direction.

S E C T. I. *The Black Stones.*

M E M B. I.

*Alcaline Stones.*I. *Saxum nigrum.*

SYMPLEXIUM *durius, nigrum, bebes.* Hill's Hist. Foss. p. 456. N^o. r.
Smith's Nat. and Civ. Hist. of the county of Cork, vol. ii. p. 372.

This stone is of a dense, firm, compact, uniform, solid texture, and moderately fine, but destitute of any brightness; of a jet black colour, of a smooth surface, very heavy, and hard, and water does not at all penetrate its substance.

It will not readily strike fire with steel.

Burnt, it becomes much harder, and of a fine clear leaden colour.

It is dug in some parts of England, but is not a common stone. Hill, however, informs us, that it is frequently thrown up in digging on Mendip Hills, but is there made no use of; but in Leicestershire, where are many strata of it, it is burnt into lime, and makes a very good kind, and with very little firing in comparison of many other stones.

It is also found in plenty near the Church Town, between that and Lis-carol, in the county of Cork in Ireland, where it is not only burned into lime, but also great quantities of it are broken small to mend the roads.

II. *Saxum scintillans nigrescens.*

This is a lime-stone of a dusky or dull blackish colour, of a firm, compact, solid texture, moderately fine, and intermixed with sparks of spar, so as to render it somewhat bright; it is moderately hard and heavy, does not bear a smooth surface, but yet is capable of a polish, and water does not penetrate its substance.

It

It will not strike fire with steel.

Burnt, it acquires a fine clear leaden colour.

It is dug in some parts of England, but is not so common as the other kinds of lime-stone; in Derbyshire there are many strata of it.

It is burnt with the other kinds into lime.

Doctor Short, Nat. Hist. of the mineral waters of England, vol. i. p. 24 and 25. informs us, that the black lime-stone of Derbyshire is both difficult and expensive to burn, and that it is seldom burnt, except for building bridges or churches, for it presently turns hard after working, and is of perpetual duration, even more lasting than the stone, for neither time nor weather weakens its cement; but the farmers find it inferior to the brown lime-stone for their purpose.

Wallerius Mineral. Spec. 41. exhibits a lime-stone he names *calcareus aequalis niger*, found near Prague, which seems to be this species.

M E M B. II.

Stones which are not acted upon by acids.

III. *Saxum mollius nigrum.*

Sympexium mollius, hebes, nigrescens. Hill's Hist. Foss. p. 457. N^o. 3.

This species as well in texture as in colour, exactly resembles the black slate, but is not fissile; it is of a moderately firm, or compact texture, of a smooth surface, and quite dull or destitute of brightness, very heavy, moderately hard, and is easily scraped with a knife, but water does not at all penetrate its substance.

It will not strike fire with steel.

Burnt, it acquires a pale grey colour.

It is dug in most of the northern counties of England, and is very frequently used as a whet-stone to set an edge on carpenters, shoemakers &c. tools.

Woodw. Cat. E. b. 15. exhibits this species of stone, by the name of slate, very fine, got near Broadgate Park, in the manor of Grooby, in Leicestershire.

IV. *Saxum nigrum frustulis albis fluoreis mixtum.*

This stone is dull and absolutely destitute of all brightness; it is of a black colour, with large fragments of spar; these fragments of spar are milk white, and are thick set in the substance of the stone, in irregular lumps of different sizes, but are no wise blended with the black stoney matter, for without much difficulty they are beaten out, and leave vacuities where they were imbedded; the stone itself is of a coarse, soft, loose, texture, rugged and rough, and does not break like most of the other stones of this genus, into sharp shatters like a flint, but into rude lumps; it is heavy, but not hard, and water readily enough penetrates its substance.

It will not strike fire with steel.

It

It burns to a dark reddish brown colour.

This species, which is called indifferently with other stones, *Black-stone*, in Derbyshire, is often found in strata in that county.

It is not made any use of.

I suspect the *sympexium durissimum, splendidum, nigrum*, of Hill's Hist. Foss. p. 456. N°. 2. to be meant for this stone; if so, that author has given a most erroneous description of it.

Petiver Gazophyl. Nat. et Artis Tab. 74. fig. 10. exhibits and figures a stone, which he calls *Lapis Poolensis frustulis alabastrinis sparsus*, or a blackish stone with alabaster spots, of which he found several on a small island at Pool in Dorsetshire; the said stones seem only to be fragments broken off from some neighbouring stratum of this species of stone, and rolled by the waves till they were rounded, smoothed, and reduced to the form of pebbles or nodules.

Dr. Short, Nat. Hist. of the mineral waters of England, p. 76. mentions a Derbyshire *black-stone* which is very porous, as also the *toad-stone*, the stratum of which, says that author, at Matlock in that county, lies so shallow in the earth, that in some places it lies exposed to the day, where by the air it becomes more light, soft and porous, full of little holes like birds eyes, and then it is called *toad-stone*, but before *black-stone*. It is very probable the above *black-stone* and *toad-stone* are of this species, or a variety of it, and that the holes in the *toad-stone*, are only the vacuities left by the fragments of spar, which have been broken from it.

SECT. II. The White Stones.

MEMB. I.

Alcaline Stones.

V. *Saxum calcareum album*.

C*Alcareus particulis indistinctis, Calcareus æquabilis, Calculus litoralis.* Dioscor. Cæsalp. Encel. Wallerius's Mineral. Spec. 41.

Marmor solubile vagum, particulis impalpabilibus solidis. Linnæus's Syst. Nat. p. 151. N°. 1.

Marmor argillaceum. Mus. Tessin. p. 12. N°. 8.

This is a lime-stone of a very fine close, compact, and solid texture, like a flint, of a smooth surface, glittering with small sparks of spar, and is capable of a polish; it is of a sullied white colour, very heavy, and moderately hard, and water does not penetrate its substance.

It is sometimes found more rough, and sometimes somewhat cretaceous or dusty, and its colour is of different degrees of white; it also sometimes contains small particles of *entrochi*, and other heterogeneous matters, but most generally is free from any extraneous particles.

It will not strike fire with steel.

Burnt, it generally acquires a snow white colour.

This kind is found in strata in most of the mineral counties of England and Wales, as Derbyshire, Flintshire, &c. and holds some shells chiefly of that kind, hitherto called *conchæ anomia*.

It is burnt for lime, for the lime it yields is very good and strong.

VI. *Saxum calcareum scintillans albidum.*

Marmor solubile, particulis micantibus granulatis. Linnæus's Syft. Nat. p. 152. N^o. 6.

Calx, Marmor. Mus. Tessin. p. 11. N^o. 3.

Calcareus particulis dispersis, Calcareus inæquabilis. Wallerius's Mineral. Species, 43.

This species of lime-stone is of a coarse, firm, compact texture, harsh, or not of a smooth surface, of a pale ashen white colour, and thick set with glittering flakes of *entrocki*, which render it bright or dazzling, and is capable of some polish; it is very heavy, moderately hard, and water does not readily penetrate its substance.

It will not strike fire with steel.

Burnt, it acquires a clear greyish ashen colour.

This lime-stone is found in the same parts of England as the former, and forms large strata. It is also found in vast large strata in Sweden, and other parts of Europe.

It is burnt into lime, and generally yields the finest and strongest lime. In Sweden the smelters prefer this species to any other, and use it as a flux in the furnaces to absorb and destroy the acid of the sulphur, and even the sulphur itself; but all kinds of lime-stone being alkaline, may be put to the same use.

VII. *Saxum fusco-albidum.*

Purbeck-stone. Woodw. Cat. A. b. 21. et b. 22.

Sympexium durissimum, splendidum albido-fuscum. Hill's Hist. Foss. p. 450. N^o. 5.

This stone is of a dull disagreeable, pale, brownish white colour, and is not capable of a polish, tho' it cuts to a very smooth surface; it is of a fine, close, compact, texture, not quite destitute of brightness, but full of sparks of pure spar, and intimately mixed with vast quantities of small *peetunculi*, which are often saturated and filled with the same substance; it is very heavy and hard, and water does not pervade its texture.

It does not strike fire with steel.

Burnt, it acquires a clear ashen colour.

The quarries of this stone are in the island of Purbeck in Dorsetshire, from whence great quantities are brought to London, and is used in building, for pavements, &c.

Hill informs us, that this stone is likewise found in many other parts of the kingdom, and that there are large strata of it in Yorkshire.

M E M B. II.

Stones which are not acted upon by acids.

VIII. *Saxum cinereo-albidum.*

COS *olearia*, the oil-stone. Woodw. Meth. of Foss. p. 10. N°. 35. et Cat. I. 6. 4.

Sympexium marmoreum, albido subcinereum. Hill's Hist. Foss. p. 452. N°. 8.

This stone is of a whitish colour, with a very faint admixture of a blueish grey, and is sometimes ornamented with black spots and dendritæ; it is of a moderately fine, and very firm and compact texture, has some brightness, and is capable of a tolerable polish, is very heavy, and considerably hard, and water does not at all pervade its texture.

It gives fire very freely with steel.

Burnt, it acquires a pure white colour.

This species of stone has not as yet been found in England: In the eastern parts, from whence it is chiefly brought us, there are large strata of it; and in some parts of Germany, strata of it are not unfrequently met with.

It is in great use with our artificers for setting a fine edge on their tools, and is only used with oil, which in process of time by degrees changes its colour to a deep brown: It is vulgarly called by them the *Turkey-stone*, as being imported to us from the Turkish dominions; but they also give the same name to another stone of a quite different genus, hereafter to be described, and which they use for the same purposes.

Linnæus's Syst. Nat. p. 187. N°. 9. exhibits a stone he calls *Saxum quartzosum marmoreum cinereum*, found in the mines at Sahlberg in Sweden, and in which the lead ore is there lodged, which stone is probably referable to this species.

S E C T. III. *The Ash and Grey Stones.*

M E M B. I.

Alcaline Stones.

IX. *Saxum subcinereum.*

THIS lime-stone is of a pale dull ashen colour, very heavy, and moderately hard, rough, of a moderately fine, firm, compact texture, and has some few sparks of pure spar, and small flakes of *entrochi*; intermixed in its substance; by which the stone is not quite destitute of brightness, and water does not pervade its texture.

It will not strike fire with steel.

It burns to a pure white colour.

This species of lime-stone is found in many parts of this kingdom ; in Derbyshire, where there are large strata of it, it generally accompanies, or is near to, the lead ore.

M E M B. II.

Stones which are not acted upon by acids.

X. *Saxum viride-cinereum.*

THIS stone is of a strong dull greenish grey colour, excessive hard and heavy, very rugged, of a fine, firm, compact, strong texture, moderately bright, and water does not at all pervade its texture.

It strikes fire freely with steel.

It burns to a pale dull brown colour.

This stone is found in large strata in the island of Anglesey, as also in some parts of Llyn in Carnarvonshire, in Wales.

XI. *Saxum caeruleo-cinereum durissimum.*

Of a blueish grey colour, of an excessive hardness, but very light, of a fine, compact, solid texture, and is not quite destitute of brightness; its surface is very smooth, and water does not at all enter its texture.

The loose masses of it, which are found dispersed in the strata, are sometimes so extremely compact, solid, and smooth, as entirely to approach to the texture of a flint, and appear like one.

It very readily strikes fire with steel.

Burnt, it acquires a pure white colour.

This species of stone is found in the free-stone quarries in Surry, described p. 126. *supra*, and is by the quarry-men vulgarly called *flint*; in the Godstone quarries it forms a layer of about four inches thick, at five feet and a half deep in the stratum of free-stone; in the quarries at Gatton, it runs quite through the middle of the stratum of free-stone; in the Chaldon quarries there is no regular layer of it, but very often large loose masses of it are found imbedded in the free-stone, very irregularly and at all depths; the layer or stratum of this rock-stone does not always form a regular solid stratum, but in some places, and that for considerable spaces, it lies only in large masses, tho' it regularly joins to and continues the layer.

SECT. IV. *The Red Stones.*

MEMB. I.

*Alcaline Stones.*XII. *Saxum rubrum, splendidum, durissimum.*

MARMOR *purpureum ex Oelandia Sueciæ.* Worm. Mus. p. 44.
Marmor Oelandicum rubrum. N. Vallinus in Differt. de Oelandia, p. 33.
 70. et 71. Leopold de Itin. Suec. p. 24.

Marmor solubile, fragmentis horizontalibus subfissilibus. Linnæus's Syft. Nat. p. 151. N°. 4. Id. It. Oeland. p. 51. Mus. Tefsin. p. 12. N°. 5.

Sympexium rubrum, splendidum, durissimum. Hill's Hist. Foss. p. 455. N°. 2.

This is a very fine stone, and capable of an exceeding good polish; it is of a dull tho' agreeable red colour, very heavy, and extremely hard, of a fine, firm, compact, bright texture, and water does not at all pervade its structure.

Vallinus, Leopold, and Linnæus, mention also a white stone of this same kind, and dug with it, which they reckon only as a variety of this species.

This stone generally contains a particular species of shell, which is the *Orthoceratites*, or fine large strait nautilus: these shells very easily separate from the stone when broken, and when the slabs are polished, as they generally are saturated or filled with a fine white spar, make a very beautiful appearance; sometimes also these shells are immersed perpendicularly in the stone, and then the spots they form are circular and exactly resemble pieces of money, which Wormius particularly mentions, of a table he had of it in his collection.

It will not readily strike fire with steel.

Burnt, it acquires a pale red colour.

This stone is dug only in the island of Oeland, in the Baltick Sea, opposite to the city of Calmar in Sweden, and is one of the principal articles of trade of that city.

There are immense strata of this stone all over the said island, not only on the hills, but also in the low grounds; it lies under other strata of stone, and the inhabitants dig them out of the quarries, and cut them into slabs of various dimensions, with peculiar instruments, on account of its extreme hardness.

After having cut them into slabs, the inhabitants of the north part of the island, especially in the Parishes of *Hægzzrum* and *Hægby*, have a very remarkable and dextrous method of polishing a great number of these slabs at one time by cattle, with a machine, which they there call a *skurequarn* or *skurering*, i. e. a *scouring circle*, the description whereof Vallinus gives us, as follows.

“They raise (says that author) a large circle of these stones ready cut, the sides of all which lie close together, and they are fixed in the earth on one of their surfaces, the other flat surface remaining exposed. They then place two or three large beams of wood, in which they make large holes at one end,

and fix the beams by these holes to a stake or log set fast in the ground, in the centre of the circle; they are so placed or managed, as not to obstruct each other's working, and in such a manner, that the said beams, whose ends reach beyond the outer edge of the circle, can be easily drawn quite round it. To these beams they fix crosswise, to that end which extends beyond the borders of the circle, and exactly in that place in which the beams touch the circle, a piece of wood; in this piece of wood on the surface, which lies downwards, or touches the circle, they fix two iron teeth, or nails, one at each extreme of it; after that, in these same pieces of wood, they place two slabs of this stone, a slab to each tooth; in this manner, the beams are drawn round the whole circle by the cattle; and, to render them heavier, in order to press strongly on the circle, they fix a box to the cross piece of wood on each beam, which they fill with a great weight of stone, or any other rubbish, and thus by the continual attrition of the slabs fixed in the beams, and which are continually drawn round by the cattle, and by constantly throwing water and sand on the stones of the circle, all the stones of the circle become perfectly polished, so as not to shew the least chink or flaw in them."

This stone is greatly valued, and is used for tables, chimney-pieces, stairs, and other stone-works, but chiefly for pavements, for which use, as it is little inferior to marble, considerable quantities of it are imported from Sweden: In London it is vulgarly called the *Norway Red-stone*, but very erroneously, as it is not dug either in the kingdom of Norway, or in the kingdom of Denmark, as Hill asserts.

XIII. *Saxum rubrum.*

This stone is of a fine deep red colour, of a compact, solid texture, somewhat smooth, and moderately fine, but entirely opaque, and quite destitute of any brightness; it is very hard and heavy, and water does not at all penetrate its texture.

It will not strike fire with steel.

Burnt, it suffers not the least change.

There are strata of it in some parts of Switzerland; and loose masses of it, broken off from their strata, and rounded and worn smooth like pebbles by the motion of the water, are not unfrequently found in the river Birsa, in the Canton of Basil, and in the other rivers of that country.

XIV. *Saxum pallide rubens.*

Sympexium hebes, pallide rubens. Hill's Hist. Foss. p. 455. N^o. 1.

This is of a pale red colour, of a firm, compact texture, opaque, moderately fine and smooth, considerably heavy and hard, and water does not penetrate its texture.

It will not strike fire with steel.

It burns to a greyish red colour.

It

It is dug in several counties of England; in Leicestershire particularly, says Hill, it is very common, and is used in building walls, and other coarse works, and in some places it is burnt into lime.

XV. *Saxum scintillans pallidissime rubescens.*

This stone is of a rugged surface, generally of a ruddy or very pale reddish colour, but sometimes it is also found of a dull greyish colour, without any redness, very heavy and hard, of a fine, compact, firm texture, considerably bright and glittering, and is composed of a pure spar, sometimes free, but generally thick set with minute specks of a black mica, which are lodged in the spar, in such a manner as to appear like a grit; water does not at all penetrate its texture.

It strikes fire difficultly with steel.

Burnt, it acquires a dusky brownish colour.

It is dug in some parts of England, but is no common stone.

It is generally burnt into lime, and is also sometimes used in building.

SECT. V. *The Brown Stones.*

M E M B. I.

Alcaline Stones.

XVI. *Saxum rubro-fuscum.*

THIS is a lime-stone of a dull deep reddish brown colour, very heavy, and moderately hard, of a fine, firm, close, compact texture, of a nearly smooth surface, but quite destitute of any brightness, and water does not at all penetrate its texture.

It will not strike fire with steel.

Burnt, it acquires a pure white colour.

There are strata of this lime-stone in Derbyshire, particularly near Ashborn.

SECT. VI. *The Blue Stones.*

M E M B. I.

Alcaline Stones.

XVII. *Saxum durissimum, subcæruleum.*

Sympexium durissimum, subcæruleum. Hill's Hist. Foss. p. 454. N^o. 2.

This is of a blueish colour, extremely heavy and hard, of a firm, compact texture, and generally full of shells, or their casts of spar, which are lodged in all directions, and nearly equally in all parts of the stone; it is not quite destitute

destitute of brightness, as in some places it is a little shining, and is capable of a very good polish, and water does not penetrate its texture.

It will not readily give fire with steel.

It burns to a pale whitish grey colour.

The quarries of this stone are in the island of Purbeck in Dorsetshire, from whence great quantities of it are brought to London, where it is in common use in pavements, for in building it is not much used, being difficult to cut.

S E C T. VI. M E M B. II.

Stones which are not acted upon by acids.

XVIII. *Saxum durissimum cœruleum.*

THIS stone is of an agreeable pale greenish blue colour, of an extreme great hardness, and heavy, of a fine, firm, close, compact texture, somewhat rough, not quite destitute of brightness, and seems capable of a polish, and water does not at all penetrate its texture; it is composed of a blue earth firmly cemented, and hardened by a crystalline substance, which is also intermixed with a little spar, for which reason this stone for some few minutes ferments slightly with aqua fortis, but after remains not the least acted upon by the menstruum.

It strikes fire pretty freely with steel.

It burns to a pale brown colour.

This stone is found in the collieries at Coalbrook-dale in Shropshire, where the colliers vulgarly call it *Plain Pelwill*. The stratum of it lies at about forty four yards depth; but it is not constantly found in those collieries, as it is one of the *new series of measures* or *spurious strata*, which obtain in the deeper parts of the works; for in the deeper parts of the works, all the strata gradually thicken, and several of these *spurious ones* are introduced.

The stratum of this stone is so extremely hard, that the colliers can only work it either by making a fire by night, and in the morning throwing down water suddenly on it, which bursts it to pieces, or else by blowing it with gunpowder; which latter method they prefer, and chiefly use.

S E C T. VII. *The Green Stones.*

M E M B. I.

Stones which are not acted upon by acids.

XIX. *Saxum rubro-virescens.*

THIS is a beautiful stone, of a very agreeable variegation of grey, purplish red, but chiefly green, mottled and intermixed together, so as to form a reddish green colour; it is somewhat coarse and rugged, of a firm, close,

close, and compact texture, and of some brightness, heavy, pretty hard, and water does not pervade its structure; it is composed of a coarse earthy matter, flakes of a reddish talc, and a little spar, all held together and hardened by a crystalline substance.

It will not strike fire with steel.

It burns to a dusky black colour, without the least remainder of either red or green in it.

Strata of this stone are found in Derbyshire, in sinking to their lead-mines; it is vulgarly called *Black-stone*, a name they likewise give to several other stones.

It is made no use of.

XX. *Saxum fusco-viride globulis fructibus similibus obsitum.*

Carpolithus, s. *Lapis subviridis in quo est res metallica, pisis similis ex Cansdorff Zwickaviae. Carpolithus*, s. *Pisolithos cortice viridi, Medulla alba: ex Planitz Bohemiae, Robias Plinii forte. Mus. Richt. p. 222.*

Carpolithus, s. *Fruchtstein Pisolithum simul referens, fructibus nigris, in saxo viridiflenti et subrubro prope Cygneam s. Zwickaviam; et Carpolithus ex Hungaria, in quo semina viridis sunt coloris; et Amygdaloides Zwickaviensis, s. Lapis viridis amygdala sui coloris continens. Kundm. Prompt. p. 217. N°. 5. Id. Cat. Coll. Rer. Nat. et Artif. p. 225. d. 11. p. 227. d. 14. et 18. et Id. Rarior. Nat. et Art. P. I. Art. 15. p. 146.*

Lapis fuscus amygdala petrificata curiose undique constringens, ex agro prope Planitz. Eller's Gazophyl. Rer. Mineral. p. 139. N°. 189.

Amygdalites, vel Amygdaloides. Lapis Planitzensis, ex agro Zwicaviensi. Mylius's Saxonia Subt. P. I. Rel. v. p. 34. et seq. fig. 1. et 2. Scheuchz. Mus. Diluv. N°. 114. Id. Oryctogr. Helvetica, p. 235. et Id. Herbar. Diluv. p. 100. N°. 431.

Pisa viridis coloris in saxo fusco. Wickenstein. Mylius Ib. 1. c. Scheuchz. Mus. Diluv. N°. 120. Id. Oryct. Helv. p. 207. et Id. Herb. Diluv. p. 65. N°. 18. Wolckman's Silesia Subter. p. 129. Tab. xxii. fig. 5. p. 131. Tab. xxiii. fig. 5, 7, 8, 9, et 10.

This stone is of a dark green colour, with a strong cast of brown; it is coarse, rough, and rugged, and quite destitute of any brightness; it does not break into sharp shatters like most of the other stones of this genus, but into rugged irregular lumps, and is very heavy and hard, and water does not penetrate its texture.

The stoney substance is of a firm, compact, and almost solid texture, and is pretty thick set quite throughout its substance with oval concretions, from the size of a turnip seed, to that of a common cherry kernel; they all lie in distinct cavities, but with no regularity or order, and are in no contact with the stone, or blended with it, but are quite independent from it, and are not difficultly broken out; their surfaces are quite smooth and glossy, of a very dark green colour, and they exactly resemble the berries of plants; they are solid within, moderately hard, and are all of one same texture and substance, which is a dark green earthy matter.

It

It strikes fire freely and copiously with steel.

It burns to a deep brownish red colour.

This kind is particularly dug at Planitz near Zwickan, a town in the metallic or mountainous district of Misnia in Saxony; it not only lies in large rocks, but likewise in strata in the coal-pits of that place.

This, and the two following stones, which are not only very beautiful, but also very singular subterraneous productions, have (with some other species of like construction, which are but imperfectly described by authors) generally obtained the name of *Carpolithi*, or fruit stones, not only from the resemblance which the kernels or concretions with which they are thick set, bear to the seeds and kernels of fruits, to peas, beans, berries of plants, almonds, &c. but that even some authors have thought them to be those very fruits and berries petrified.

Not only rocks of these species are found, but likewise strata; many specimens of them are exhibited by authors, but as they have generally formed their species on the shapes of the kernels or concretions, being like beans, berries, almonds, &c. and have never had due regard to the texture or substance of the stone, we shall, on strict application, find the true species to be few, but the varieties of them to be many.

These stones are found in many parts of Germany. Wolckman, *l. c.* notes the following places in the duchy of Silesia, which especially abound with them, *viz.* the Porschelberg near Landeshutt, near Schonau, and at Neukerche, in the Goldberg Territory; they are also found in several parts of Hungary and Bohemia, and in some other places of Saxony, besides Zwickau.

Mylius *l. c.* gives us a pretty particular account of some circumstances relating to this Zwickau stone; that author says, That it is to be observed, that this stone is not always thick set with these concretions, for on the first discovery of them, the upper parts of the rock or stratum were quite filled with them, but as they dug deeper in the stratum, they diminished in quantity and size, till no more of them were to be found.

The stones which Dr. Woodward exhibits, Cat. E. b. 8. among the stones of strata, and which he describes to be brown with a cast of green, thick set with small holes, some of them filled with a blackish stoney matter (found on Blackberry-hill near Stratton, Devonshire; there were many more lying on the ground thereabouts; and there are also of them in Cornwall; they are called *Honey-comb-stones* in both counties) seem referable to this species of stone.

Tho' these stones have obtained the name of *Carpotili*, from their likeness to fruits, yet they are not to be confounded with other stones of the like name, which also, from their resemblance to fruits, have been so called, and occur pretty frequently in the fossil writers; these latter are generally loose flinty nodules, shaped like fruits of various kinds, and are mere *lusi naturæ*; neither is the *Lapis frumentarius* or *Lentes lapideæ* of authors to be confounded with them, as these are the remains of animal bodies, buried at the time of the universal deluge, and are only the opercula or lids of turbinated shells of various kinds.

XXI. *Saxum viridescens globulis fructibus similibus obsitum, f. Carpolithi species altera.*

Lapis frumentaceus viridis seminibus viridibus oblongis. Ex Litt. D. Bruckmanni, ad me datis.

Phytolithus ochraceus mixtus lapillis calcariis, f. Carpolithus viridis, cujus rupes Ilfeldæ prostat. Gronovii Supell. Lapid. p. 101. N°. 11.

Carpolithus subviridis, ex Hercyniæ montibus. Kundm. Cat. Coll. Rer. Nat. et Artif. p. 227. d. 13.

This kind is of a greenish colour, with a strong cast of a dark purplish brown; it is a coarse, rugged stone, soft, and immediately breaks into rude irregular lumps; it is of a pretty firm compact texture, and quite destitute of any brightness, very heavy, and water does not at all penetrate its texture.

The concretions in this species are very thickly set in the stone, in cavities, without any regularity or order, and in like manner, are not in the least blended with the substance of the stone, but are easily broken from it.

The shapes as well as the substance of these concretions are very different, some are oval, others oblong, some flatted spheroids, others somewhat irregular, they are of all sizes, from that of a pin's head, to that of a common plumb-stone, but few are of the latter bigness; exteriorly, some are milk white, others brownish, but neither smooth nor glossy; interiorly, some are quite hollow, and are finely crystallized with a pure pellucid crystal, the others are all quite solid; some are composed of a whitish semipellucid crystal, others of a glossy, opaque, milk white, flinty substance, or a milk white friable marle, and the rest of a dazzling flakey reddish talc.

It is too soft to strike fire with steel.

It burns to a reddish brown colour, but the kernels or concretions suffer no change in the fire.

There are rocks of it at the Abbey of Ilfeldt, in the duchy of Hohenstein, on the entrance to the Hartz; the inhabitants of that place call it *Grünstein*.

I have likewise received specimens of this species, from my learned friend Dr. John Bohadsch, Imperial Professor of Natural History at Prague. The said Gentleman informs me, there is a large mountain of this stone at Friedstein, in Bohemia. The Bohemian stone has often large kernels of the size of walnuts, of that sort which is composed of the glossy, opaque, milk white, flinty substance, and of those which are finely crystallized within; these larger kernels are very often beaten out of the stone by the weather, and are found in some quantity loose in the neighbouring lands, like so many white flints, or nodules crystallized within, of which more will be said in their proper genera.

Linnaeus, and the Mus. Tessin. exhibit a very particular kind of reddish lime-stone found in Sweden, which in like manner is full of globose kernels, finely crystallized with spar within. The former author, *Syst. Nat.* p. 151. N°. 3. and *It. Westrogoth.* p. 21 and 28. describes it *Marmor solubile, fragmentis subrotundis. Gorsten*. The latter, p. 12. N°. 6. calls it *Marmor nodosum*.

XXII. *Saxum viridescens globulis parvis, seminibus similibus, obsitum, f. Carpolithus Anglicanus.*

This stone is of an agreeable greenish colour, very heavy and hard, rough and rugged, and destitute of any brightness; it is not of a very firm and compact texture, water does not at all penetrate its substance, and it breaks easily into rude irregular lumps.

The concretions or kernels of this species, which very much resemble seeds or kernels of fruits, are in like manner, as those of the two before described species, thick set quite throughout the substance of the stone, without any order or regularity in their proper cavities, and are with some difficulty freed from the stone. They are small, of the size of grape-stones, and roundish, of a dark green colour, and solid, and are composed of an earthy substance, indurated with a crystalline matter; veins and lumps of a white opake, glittering, shattery spar, and some pieces of a bright brassy marcasite, are often found intermixed in the stone.

It strikes fire readily with steel.

It burns to a pale dull flesh colour.

It is found in strata in Derbyshire in sinking to their lead mines, and is one of the stones called by the miners there *black-stone*.

S E C T. VIII. *The variegated Stones.*

M E M B. I.

Alcaline Stones.

XXIII. *Saxum griseo-fuscum, nigro luteoque variegatum.*

THIS is a variegated stone, the ground is of a pale greyish brown, with large spots of a darker colour, of a blackish colour, and of a pale yellowish colour, but none very striking or beautiful, tho' agreeable to the eye; these colours penetrate quite through the stone, which has very little brightness, tho' it is capable of a smooth, glossy surface, or pretty good polish.

It is extremely heavy, and moderately hard, of a coarse, firm, compact texture, and water does not at all penetrate its substance.

It strikes fire very difficultly with steel.

It burns to a deep brown or purplish red colour, and in some few parts to a whitish grey colour,

A stratum of this stone lies immediately above the free-stone stratum in the quarries at Hasely, near Tetworth, in Oxfordshire. It is vulgarly called by the inhabitants *Curl-stone*, and is used by them like marble, for chimney-pieces, tables, &c.

XXIV. *Saxum*

XXIV. *Saxum album luteo variegatum.*

Sympexium durissimum, hebes, albido flavescens. Hill's Hist. Foss. p. 451. N^o. 6.

The ground of this stone is of a dull white colour, variegated with veins and spots of a pale yellow; it is of a rough surface, has very little brightness, and is not capable of a polish; its texture is irregular, moderately fine, and in general very firm and compact; it is very heavy and hard, and water does not at all penetrate its texture.

It does not readily strike fire with steel.

Burnt, it acquires a fine white colour.

It is common in Dorsetshire, and is also dug in some other counties of the kingdom; and is sometimes used in building, as it bears the weather well.

XXV. *Saxum fusco-cæruleum, rubro alboque variegatum.*

Sympexium durius, fusco-cæruleum, hebes. Hill's Hist. Foss. p. 454. N^o. 3. Smith's Nat. and Civil Hist. of the county of Cork, vol. ii. p. 372.

This is of a dusky brownish blue colour, variegated with spots and veins of a pale red, and an opaque white; it is a coarse, rough stone, quite destitute of any brightness, considerably hard and heavy, of a pretty firm, compact texture, and water does not at all penetrate its substance.

It will not strike fire with steel.

Burnt, it acquires a blueish white colour.

There are strata of it in many parts of England, especially in Leicestershire, where it is vulgarly called *blue lime-stone*, and in Yorkshire: in Ireland, in the barony of Muskerry, in the county of Cork, strata of it are also found, and it is in all those places chiefly burnt into lime.

SECT. VIII. MEMB. II.

Stones which are not acted upon by acids.

XXVI. *Saxum fuscum, rubro variegatum.*

THIS stone is of a yellowish brown or clay colour, variegated with angular spots, and undulated veins of a darker colour, and bordered by other veins of a lighter colour, and of a dark purplish red colour, very agreeable to the eye, but not very striking or beautiful; it is capable of a very even and perfectly smooth surface, but not of a glossy polish.

Its texture is very fine, close, compact and solid, like a flint, very heavy and hard, and water does not penetrate its substance; it is composed of a brownish earthy matter, indurated by a crystalline substance, intermixed in some places with a little spar, on which account some pieces of it, at first,

slightly ferment with aqua fortis for a few minutes, but soon remain untouched by that menstruum.

It strikes fire difficultly with steel.

Burnt, it acquires a deep purplish red colour, with slate coloured veins and spots.

Strata of this stone are found in the collieries near Coalbrook-dale, in Shropshire; it lies at about forty four yards depth, but it is not a constant measure, being like the *Saxum durissimum caeruleum*, already described, p. 158. one of the new series of measures or spurious strata, which obtain in the deeper parts of the works.

As it is capable of some polish, and is prettily variegated, the inhabitants of those parts call it *The flowered Pellwyll*, and often use it like marble, for chimney-pieces, tables, &c. and it makes a very pretty appearance.

S E R I E S II.

C H A P. II. G E N U S II.

Stones of a close, compact texture, of a laminated structure, and splitting only horizontally or into plates.

S E C T. I. *The Black Slates.*

M E M B. I.

Slates which are not acted upon by acids.

I. *Schistus niger, polituram quodammodo admittens.*

M A R M O R *nigrum mensarium Cordi.*

Saxum fissile nigrum. Gesner de fig. Lapid. p. 101. Worm. Mus. p. 38.
Fissile nigrum sterile, quod facile findi potest, et Saxum fissile nigrum Andegavense, ex quo non solum tegulae domorum et parietes, verum etiam tabulae et mensae fiunt, et fissile nigrum Rhenanum. Kentm. Nom. Foss. p. 55 et 56. N^o. 1, 11, 12, et 13.

Lapis fissilis sterilis. Schwenkf. Cat. Foss. Silesiae, p. 383.

Saxum fissile Glaronensium. Wagner's Helv. Cur. p. 304.

Foglio Nero et Nero Stizzoso. Imperat. Hist. Nat. l. xxv. c. 8.

Lapis fissilis niger Glaronensis, s. Ardesia nigra, s. Saxum fissile, s. Saxum crustosum. Scheuchzer's It. Alp. I. 1702. p. 19. Id. It. Alp. II. 1703. p. 47. Id. It. Alp. III. 1704. p. 7. Id. Oryctogr. Helvetica, p. 110. et p. 113. Id. Quer. Pisc. et Vindic. p. 10 et 11. Id. Mus. Diluv. p. 104. *4. et seq. et Id. Herb. Diluv. p. 7, 8, et 9. Langius's Hist. Lapid. fig. Helv. p. 33.

Fissilis subtilior, polituram quodammodo admittens. Fissilis vel Schistus niger mensalis, Fissilis niger duriusculus. Wallerius's Mineralogy, Species 65.

Lapis scissilis niger metalli expers. Bruckm. Epist. Itin. Cent. 1. Ep. 47. N^o. 1. et Cent. ii. Ep. 60. p. 656.

Schistus ater scriptura alba. Linnæus's Syst. Nat. p. 154. N^o. 2.

Schistus tabularis nigricans scriptura alba. Mus. Tessin. p. 16. N^o. 3.

Schistus s. Lapis fissilis niger duriusculus, et Ardesia tegularis nigra clangosa. Append. Ephem. Nat. Curios. vol. vi. p. 132. et seq. N^o. 3 et 4. De schisto ejus indole atque genesi meditationes Sam. Theoph. Langii.

This species of slate is of a black colour, heavy and very hard, of a fine smooth, but not glossy surface, and capable of a very good polish, of a close, compact texture, and water does not at all penetrate it, and when written on, the characters are white.

It will not strike fire with steel.

It burns to a pale brown colour.

This slate has not, as I know of, hitherto been found in this kingdom: In Sweden, and in most parts of Germany, there are many mountains and vast large

large strata of it; but that dug in Switzerland, where it is also found in very great plenty, is esteemed the finest and best in Europe.

The quarries of this slate which are the most celebrated, are on the mountain Blattenberg, (i. e. the plate or leaf mountain) so called from its being entirely made up of strata of this slate, near the village Matt, in the Canton of Glaris, in Switzerland. Of these celebrated quarries, Dr. Scheuchzer gives us the following particulars: "The strata of this slate (says that author) lie over each other in a parallel order; they are not exactly horizontal, but dip towards the south, as most of the other strata of the mountains of that country do; there are no flexures in the strata, nor is the slate anywise broken or interrupted by fissures; but veins of white quartz or spar, not an inch broad, which run both perpendicular and horizontal, and which interrupt the quarry-men very much, and spoil the slate, are found. The masses, or plates of slate, are easily dug, and are generally about ten feet in length, four in breadth, and about one third of an inch thick; what is extremely remarkable is, that each mass is composed of two laminæ or plates of equal thickness; of which that plate which lies uppermost in the stratum, is always very hard, and takes a good polish, whereas that lamina which lies undermost in the stratum, is always softer, and is not capable of a polish; and these different laminæ of hard and soft, are found alternately laid throughout the quarries, without any other difference either of colour, texture, &c. Between them; sometimes, tho' very rarely, plates of slate are found, which have lost their black colour, and have acquired an iron or rust colour, and seem sensibly decayed, as the quarry-men affirm they are; and sometimes also masses are found, of which the laminæ or plates are so soft, that they cannot be put to any use. They afterwards cut the slate into tables, slabs, &c. and polish them, and work nearly away the under or soft plate, to make them fit for use.

Between the laminæ of this slate, there are not unfrequently found fine impressions of plants and fish; but the impressions of the latter are only of their bones or perfect skeletons.

In those places where this slate rises only in small plates, as it does in many places, it is chiefly used for covering of houses, churches, &c. and many of the greatest cities of Germany, as Worms, Spire, Mentz, Goslar, &c. have it in constant use for that purpose; but the Switzerland slates, which rise in such large plates, are sent down the Rhine to Holland, as the chief mart for them for all Europe, and forms a considerable branch of trade, and are only used for tables, pavements, writing slates, or slates for schools," &c.

II. *Schistus niger scriptura atra.*

This slate is of a black colour, moderately heavy and hard, of an earthy, firm, compact texture, and moderately fine, of a smooth surface, but dull, and not capable of a polish; water does not at all penetrate its texture, and when written on, the characters remain of the same black colour, as the slate.

It is too soft to strike fire with steel.

It burns to a pale reddish colour.

It is dug in some parts of England and Wales, but is very rarely found.

The

The Mus. Teflin. p. 16. N°. 2. and Linnæus, It. Westrogoth. p. 21, 28. exhibit a kind of slate, found in Westrogothia, Gothland, and other parts of Sweden, which they call *Corvinus*, *Schistus nigricans scriptura concolore*, *Petra Cornicina*, which slate is probably of this species.

III. *Schistus niger*.

Shale, bafs, or shiver, Lithantrax sterilis nigra squamosa. Short's Nat. Hist. of the Mineral waters of England, vol. i. p. 25, 27, 33. et alibi passim.

Black shale, a sort of slate stone, Phil. Trans. N°. 407. and Eames and Martin's Abridgment of Phil. Trans. vol. vii. p. 190.

Schistus nigricans friabilis, scriptura alba. Linnæus's Syst. Nat. p. 154. N°. 3.

Fissilis mollior, fissilis friabilis. Wallerius's Mineralogy, Spec. 70.

Ardesia Eislebensium mollior nigricans Henckelii. Ephem. Nat. Curios. vol. v. p. 328.

This is a coarse, earthy slate, of a deep black colour; of a rough, unequal surface, and quite destitute of either smoothness or brightness; it is moderately hard, and rather light than heavy, of a firm, close texture, water does not penetrate it, and when written on, the characters are white.

This kind of slate, which is vulgarly called *shale*; in Derbyshire, forms vast large strata in that county; from *the day* or surface of the earth to some depth, that which lies near the surface, is always of a softer texture, than that which lies deeper, according to the observation of the miners, who also affirm, that it is more or less hard and compact, according to the hardness or softness of the strata it lies near. Thus according to its site or depth in the earth, this slate has several varieties of hardness, and texture, and even the same stratum will be extremely shivery, where it strikes out at the surface of the earth, or, as they term it, where it *bassets*, but trace it, and the deeper it lies, it will become harder, and take a plated structure, and sometimes have excessive hard kernels or knots, of the very same substance, lodged in it: it also varies, in like manner, according to the strata above, and below it, for if next above a stratum of lime-stone, it becomes more dry, hard, and brittle, and falls more into shivers when exposed to the weather; if above, or under a stratum of *bind*, which is heavy and tough, it will be more earthy and soft.

It is also found in large strata in most of the coal counties of this kingdom, and is generally met with above the coal.

This slate, when exposed to the weather, falls first into small shivers, and gradually moulders away by reason of the salts shooting, with which it is generally strongly impregnated.

It is too soft to strike fire with steel.

It burns to an ashen colour.

Dr. Short informs us, that the *shale* wastes the lead ore near it, by its strong acid, in like manner it also corrodes and destroys all minerals near it, except iron or coal, of whose vitriol it partakes; and that where there are great quantities of this substance and marcasite, the waters are so extremely cold, that miners, who work long therein, are in danger of losing their limbs.

The shiver, of a dark ash colour, near black, from a lead mine near Newcastle, exhibited by Dr. Woodward, Cat. A. b. 90. is probably only a variety of this species, as likewise that sort from the city of Goslar, exhibited by Bruckm. Epist. Itin. Cent. i. Ep. 47. N°. 3. which he synonyms *Lapis scissilis niger, pinguis, mollis, et cultri rasuram admittens*, and which, he says, moulders away on being exposed to the weather.

In Sweden this kind of slate is found in the mountains of the Province of Nericia and Scania, in Westrogothia, and also in Lapland; and Wallerius informs us, that some of it found in Sweden, when rubbed or when burnt, emits the same foetid smell as the *Lapis suillus*, or stinking-stone.

IV. *Schistus terrestris niger carbonarius.*

Fissilis sine lamellis, niger, quoad particulas tantum cum fissilibus conveniens, Fissilis carbonarius. Wallerius's Mineralogy, Species 67.

Schistus fissilis vulgaris nigricans friabilis. Append. Ephem. Nat. Curios. vol. vi. p. 132. N°. 2. De schisto ejus indole atque generis meditationes Sam. Theoph. Langii.

This is a very earthy slate, of a jet black colour, of a fine, smooth, glossy surface, sometimes of a fine, firm, compact texture, at other times the texture is loose and friable, and immediately breaks into laminæ or leaves; it is heavy and moderately hard, water does not at all penetrate its texture, and it scrapes blackish.

It is too soft to strike fire with steel.

It burns to a pale reddish white colour, and then, except in its laminated structure, exactly resembles a piece of dried tobacco pipe clay.

This slate is found in the coal counties of this kingdom, and always forms a stratum just above the coal stratum in the places where found, viz. especially in Somersetshire, Yorkshire, &c. as the blueish grey kind, hereafter to be described, does in other coal works.

When broken, between the plates, an amazing quantity of impressions of plants, very curious and fair, are always found; in the softer and more friable kinds, as that of Somersetshire, I have mostly observed the impressions to be chiefly of the fern, reed, and grass kinds; but in the harder variety, and which is not so fissile, as that of Yorkshire, Wales, &c. the impressions are very beautiful and rare, and are of reticulated, scaled, or knobbed works, impressed by vegetables mostly hitherto unknown to botanists.

Wallerius observes, that if this slate is thrown loose into the fire, it becomes white and friable, but if it be calcined in closed vessels, it retains its black colour, and if scraped becomes glossy like black lead, but with a paler colour, and more metallic appearance, and can be used like black lead, to design or draw with.

This species is also found lying over the coal in many other countries of Europe, and is like that of England, always full of the impressions of vegetables. Wallerius informs us, it is thus found in the coal pits of Sweden. Wolckman, in his Silesia Subterranea, mentions this kind among various other kinds in the coal pits at Gablau, Rothenbach, Gottesberg, and many other places

places of Silesia. Langius *l. c.* informs us, that it always covers the stratum of coal at Wettin, in the principality of Magdeburg, a place noted for its coal pits; and many other authors take notice of the same in various parts of the continent of Europe.

Woodward, Cat. B. a. 108. exhibits a black slaty stone from the Cannel coal pits, near Haigh in Lancashire: the colliers there call it *Black Bast*. The colliers about Durham, and Newcastle, call this sort *Plate*. The stratum of this is about a yard thick, lies one hundred and thirty feet deep, and thirty foot above the Cannel coal. This kind mentioned by Woodward, is only the harder and least fissile variety of this species.

SECT. II. *The White Slates.*

MEMB. I.

Alcaline Slates.

V. *Schistus calcareus flavo-albidus.*

AN *Saxum fissile subluteum*. Kentm. Nom. Foss. p. 56. N^o. 9. et Worm. Mus. p. 38?

Marmor, s. Lapis fissilis marmoreus candidus vel subflavus Eichstadiensis, s. Pappenheimensis, cum dendritis, crustaceorum pisciumque impressionibus, variorum authorum, scil. Lochneri Rar. Mus. Bessler. p. 94. et 96. Melle de Lapid. fig. Agri. Lubec. p. 23. Bayer's Oryctogr. Norica, p. 44. et p. 56. Id. Supplem. Oryctogr. Noricæ, p. 48, et p. 53. Scheuchzer's Mus. Diluv. N^o. 97, 104. &c. Id. Querel. Pisc. et Vind. p. 17. Id. Herb. Diluv. p. 40. p. 115. &c. Mylius's Saxonia Subterr. P. ii. p. 87. Kundm. Prompt. p. 222. N^o. 63, 64, 67, 68, &c. Woodward Cat. I. x. 2. et Cat. L. x. 1. Bruckman's Magn. Dei in locis Subter. Vol. i. p. 85. Ephem. Nat. Curios. Vol. viii. Obs. 115. p. 411. et seq. Ritter Comment. II. de Zoolitho-dendroidis. Mus. Richt. p. 224. 251, & 252.

Schistus pallide albus, Marmor Pappenheimense, Lapis scissilis vel potius marmoreus, et Schistus exalbidus Eichstadiensis. Gronovius's Supell. Lapid. p. 99. et p. 102.

Schistus flavus Pappenheimensis. Append. Ephem. Nat. Curios. vol. vi. p. 132. N^o. 6. De schisto, ejus indole, atque genesi, meditationes Sam. Theoph. Langii.

This is a calcareous slate, of a pale yellowish white colour, of a fine compact solid texture, like a flint, smooth and even where broken transversely, but on the flat surfaces somewhat rough; it is capable of a good polish, is heavy, moderately hard, and water does not at all pervade its structure.

It will not strike fire with steel.

It burns to a fine ashen colour.

This stone between the plates has frequently very fine impressions of the skeletons of fish, but never of their skins or scales, likewise impressions of several kinds of crustaceous animals, especially of a small species of sea-star; it is

also frequently beautified with elegant superficial dendritæ, or ramifications of a black, a brown, or a yellow colour, and sometimes of all these colours in one dendrites. Specimens of this stone with these dendritæ and animal impressions, occur frequently in the later writers on fossils, who have exhibited them by the names of *Ithyolithi*, *Carcinitæ*, et *Dendritæ Pappenheimenses vel Eichstadienses*.

This slate forms vast large strata in the county of Pappenheim, and in the bishopric of Eichstadt in Franconia; there are many quarries of it, especially at Solenhof and Herspruck; they hew it out of the quarries in small plates to cover the houses, and also in large slabs for tables, pavements, and various other uses.

This stone is likewise found in plenty in many other parts of Germany, sometimes with the like impressions of fish on it, but more generally only adorned with dendritical ramifications. At and near the city of Osnabrugh in Westphalia, there are quarries of a softer and coarser variety of this stone, which generally is embellished with like dendritæ, and masses of a fine kind of laminated *Manganese*, hereafter to be described; is also found frequently lodged in it.

The Italian *Schistus* of the mountain Bolca, on the confines of the territories of Verona and Vicenza, and which has always curious impressions of various kinds of fish on it, of some insects, and of some plants, is of this same species. Boccone Museo di Fisica e di Esperienze Osserv. xliii. p. 281. Hist. et Mem. de l'Acad. Roy. des Sciences de France, Annee 1703. Scheuchzer's Mus. Diluv. N°. 7. et p. 103. N°. 17. Id. Querel. Pisc. et Vindic. p. 11. et Id. Herb. Diluv. p. 21, 22. Woodward Cat. K. μ . 13. and lastly, Vallisneri de' Corpi Marini che su' Monti si trovano, are the authors who exhibit this Bolca stone. The latter author, p. 2. and 3. gives us moreover the further following particulars relating to it: "The Mountain Bolca, which is entirely made up of this kind of *Schistus*, in which not only impressions of fish, some impressions of flying insects, and of various kinds of plants are found; also abounds with vast variety of testaceous petrifications; it is very craggy, about three hundred and sixty feet high perpendicularly taken, is quite steril or without trees or plants, and even without water; the soil is quite parched up, and of a reddish colour, the *Schistus* lies in nearly horizontal strata, which only dip a little towards the descent of the hill; they are composed of numerous thin plates, and in some places are broken or interrupted by fissures.

The *Schistus* with impressions of fish and small sea stars, which is found in great plenty on Mount Libanus in Tripoli disoria, in the Province of Castravan, and in other parts of the east, and which are exhibited by Woodward, and many other fossil writers, is of this same species.

VI. *Schistus terrestris fusco-albidus*.

Lapis fissilis candidus cretaceus Oeningensis. Scheuchzer's Mus. Diluv. N°. 35, 36, 109, &c. Id. Herb. Diluv. p. 15, 17, 19, &c. Id. Pisc. Querel. et Vind. p. 12, &c. Id. Oryctogr. Helvetica, p. 234. p. 334, &c. Langius's Hist. Lap. fig. Helvetiæ, p. 38. Woodward Cat. K. a 1, 2. † a 2. et μ . 14.

This species of *Schistus* exactly resembles a hardened or lapidified cretaceous earthy substance; it is of a pale disagreeable brownish white colour, of an even surface, but quite destitute of either smoothness or brightness; it is heavy, and of a pretty firm close texture, soft, and easily scraped with a knife, and water readily penetrates its substance.

It is too soft to strike fire with steel.

Burnt, it acquires a deep ashen colour.

It is dug in the quarries at Oeningen, in the bishopric of Constance, in the circle of Swabia in Germany; and very curious impressions of the skeletons of fish, and impressions of plants of several kinds, are frequently found between its leaves or plates.

VII. *Schistus cretaceus pallide albidus.*

An Steganium albidum fragile. Hill's Hist. Foss. p. 438. N^o. 1?

This is a cretaceous slate, of a dead white colour, quite dull and destitute of any brightness, of a pretty compact, close texture, of an unequal surface, and is generally thick set with veins of coarse spar, which have been only fissures in the stone afterwards filled with the said sparry matter; it is moderately hard and heavy, and water slowly penetrates its texture.

It will not strike fire with steel.

Burnt, it acquires an ashen colour, with a pale reddish hue.

It is dug in several parts of this kingdom.

SECT. III. *The Ash and Grey Slates.*

M E M B. I.

Alcaline Slates.

VIII. *Schistus marmoreus cæruleo-cinereus.*

THIS slate is of a fine pale blueish ash colour within, but it is generally covered with a yellowish white crust, adorned with superficial blackish dendritæ. It is of a fine compact solid texture, like a flint, and of a very fine sparry constitution, not glossy or bright, but is capable of a very good polish, and looks like an opake agate; the masses of this species are generally pretty large, about an inch thick, and are visibly constructed of other thinner laminæ, lying even and parallel to each other, which however cohere so firmly together as not to be separated without difficulty; it is moderately heavy, and very hard, its surface is extremely smooth, and water does not at all penetrate its structure.

It will not strike fire with steel.

It burns to a very pale reddish brown colour, and soon after being thrown into the fire it bursts into a great number of thin plates.

This species, with a red kind hereafter to be described, form large strata, (intermixed together, and with no small quantity of asbestos lodged in them) in the Alps of Savoy, particularly at a place called Levon, in the Canavesan.

Wallerius's Mineralogy, species 143. exhibits a species of laminated stone of that genus which (from its horny colour, and solid texture) he calls *horny rock* or *corneus fissilis*, the variety N^o. 2. of his said species, he calls *corneus fissilis durior*, and describes it to be hard and solid, but that often it freely divides lamellarly, and then is used, especially in Piedmont, to cover the houses. I do not doubt the said stone is of this species.

IX. *Schistus fusco-cinereus*, *Lapis foetidus dictus*.

Lapis foetidus f. *Felinus*, vel *Schistus foetidus*. Bruckm. Epist. Itin. Cent. ii. Ep. xiii p. 105. et Id. Ib. Ep. xxxi. p. 342. Alb. Ritter. Supplem. Script. Suor. p. 11. Kundm. Cat. Coll. Rer. Nat. et Artific. p. 197. b. 239.

Schistus fuscus fragilis foetidus, *Lapis felinus*, qui ferro attritus urinam felium redolet. Gronovius's Supell. Lap. p. 10. N^o. 7 & 8.

Of a dark disagreeable terrene ash colour, of a harsh or rough surface, and quite destitute of either glossiness or splendor; it is light, moderately hard, and of a fine, firm, compact texture; the plates of it are thin, numerous, and evenly laid; it is composed of a coarse, brown, earthy substance, cemented and hardened by a great quantity of sparry matter; water does not pervade its structure, and when written on, or rubbed, it yields a whitish powder.

This slate, say the authors who have treated of it, when rubbed hard, emits a very foetid smell, like that of cats urine; but whether the specimens I enjoy (by the favour of the gentlemen here quoted) by process of time have lost their smell (which Ritter says they will do) I cannot determine, I own; I am not so happy as to possess the faculty of perceiving the said foetid smell, tho' I have many times repeated the experiment.

It will not strike fire with steel.

Burnt, it acquires a clear ashen colour.

This species of slate is dug at the village Badra, in the territory of Sonderhusen, also near the Abbey of Ilfeldt, in the duchy of Hohenstein, and at the village Wigersdorff, and the Mountain Muhlberg, also at the village Steintaleben, in the principality of Schwartzburg; at first it was dug in very great quantities, but of late years it has been found rarely, and but in some places of the mines there; it is also found at the village Furra, in the duchy of Saxony.

At Ilfeldt they use this stone in their smelting houses, as a flux to the iron ores.

Bromel, Lithogr. Suecana, c. 8. figures a stone, which he calls *Lapis scissilis fuscus ac foetidus*, which, between its plates or laminæ, is thick set with bodies or petrifications of small insects of the beetle kind; it is dug in the lime-stone quarries of the parish of Karabylonga. The said author mentions this same stone again in the Actæ litter. Suec. Anno

1729.

1729. p. 525, 529, 530, &c. and says it is also dug in the parish of Dala, and several other places near the ancient city of Skara, in Westrogothia. He further, Ib. Anno. 1727. p. 310. mentions another sort adorned with black dendritæ, which he calls *Lapis cinerei coloris fossilis fœtidus*, *Suillus dictus*, found in the sandy soil at Giarstad, near the town Schenningen in Ostrogothia, both which stones are probably to be referred to this species of slate: in Sweden they are used as remedies in the diseases of the swine.

S E C T. III. M E M B. II.

Slates which are not acted upon by acids.

X. *Schistus viridi-cinereus.*

THIS is of a deep greenish ash colour interiorly, exteriorly it is of a rugged and rough surface, and is generally covered with a rust coloured substance, proceeding from a species of brassy marcasite, which commonly is found with it; the masses of this slate always break into short narrow slips, exactly like wooden lathes; they are generally about half an inch thick, and three or four laminæ or plates, which lie very parallel and even, and which bear a very smooth surface, are easily discernible in them, and are very easily divisible; it is of a fine, strong, talcy, flakey or stringy texture, moderately heavy, and not hard, quite destitute of glossiness or brightness, and water does not at all penetrate its structure.

It will not strike fire with steel.

It burns to a pale brownish reddish colour.

There are very large strata of this species of slate about Tan y Bwlch, in Merionethshire, and also in the northern counties of the kingdom.

The Rag-stone exhibited by Woodward, Cat. A. b. 70, which he describes as a grey talkey stone, and is used for setting an edge to knives, chizzels, axes, and the like, after grinding them on stones of a harsher and coarser constitution, is this very species.

The *Steganium griseo-cæruleum scintillans*. Hill's Hist. Foss. p. 460. N°. 4. is also only a variety of this species.

In Wales it is not made any use of as a slate, as it breaks into such short pieces, and that they do not know its value as a whet-stone; but in the other parts of England where it is found, it is in general use as a whet-stone, and is an excellent stone for that purpose.

XI. *Schistus cinereus.*

This is of a pale blueish grey colour, of a fine, smooth surface, of a compact, firm, texture, and the masses of it are composed of multitudes of thin laminæ, laid close one on the other; the thickness that this slate generally splits

splits into, is of one quarter of an inch; it is very light, and moderately hard, and water does not at all penetrate its structure.

It will not strike fire with steel.

Burnt, it acquires a brown colour, with a slight cast of purple.

There are very large strata of this species in the Mountains of Caernarvonshire in Wales, and in other parts of the kingdom; the strata in Caernarvonshire dip very much.

This slate is also sometimes found of a deep grey colour, with a cast of purple; this variety is especially found in the mountains near Caernarvon, and sometimes it is also found veined with green, and adorned with some few coarse dendritæ.

It makes a most elegant as well as excellent covering for houses.

The slate exhibited by Woodward, Cat. A. b. 80. and of which there are great quarries at Newlands in Cumberland, about a mile from the black lead mines, is of this species.

The said author, Cat. C. b. 19. exhibits a dark grey slate, which probably is also of this same species, from Mullinecke, where it is used for coverture of houses: The Doctor further informs us of the following particulars of those quarries. "The strata of the slate there (says that author) lie pretty much inclining, and are of considerable extent; the slate lies from near the surface, down to the level of the tide that flows up the river, in the cliffs of which it lies. What lies underneath is uncertain, they not sinking to the bottom of the slate. There are flexures in several parts of the work, tho' not frequent. Where they are, they run from the top downwards, as far as I observed. There were several perpendicular fissures in the slate, but they were narrow like cracks, and empty. I imagine, that at the same time that the slate cracked in one part, 'twas in others so tough as to abide being bent; by which means these flexures were probably formed. I have seen strata of coal, near Lanelthy in Wales, with like flexures, but larger. Sometimes they were cracked at the angles of the flexures; the intermediate mass, tho' parted from the rest, lying obliquely. I have observed slate cracked, with the intermediate part lying obliquely, in several parts of Wales, and of Cumberland."

This species of slate is also found in many parts of Germany.

Smith's Nat. and Civ. Hist. of the county of Cork, vol. ii. p. 373. mentions a slate of a dark grey colour, having its surface intermixed with a yellow shining marcasite, which is dug in the island of Cape Clear: this slate splits always into oblong regular figures, as if wrought by a tool, and some of it makes good flags for steps, and flooring to courts, houses, &c. a like sort of slate is also exhibited by Linnæus, Syst. Nat. p. 154. N°. 4. who names it *Schistus cinereus solidiusculus scriptura cana*. It is dug in all the Mountains of Westrogothia, Nericia, and Scania in Sweden, and also in Lapland; the said slate seems to be only a variety of this species.

XII. *Schistus terrestris carbonarius cæruleo-cinereus.*

Schistus f. Fissilis inutilis rudis cinereus. Append. Ephem. Nat. Curios. vol. vi. p. 132. N°. 1. De schisto ejus indole atque genesi meditationes Sam. Theoph. Langii.

Steganium friabile fusco-subcæruleum. Hill's Hist. Foss. p. 459. N°. 2. Smith's Nat. and Civil Hist. of the county of Cork, vol. ii. p. 373.

This slate is of a pale blueish grey colour, of a close, compact, coarse, earthy texture, of an irregular and obscurely laminated structure, moderately hard, and very heavy; its surface is smooth, but it is quite destitute of either glossiness or brightness, and water hardly pervades its structure.

This species is composed of a great quantity of grey earthy matter, indurated by crystal, and indeed it appears only as a hardened or lapidified laminated earth.

When first dug it generally is solid and very hard, but on being exposed to the weather, it readily falls to shivers, and is always full of curious impressions of vegetables, chiefly of a blackish colour.

It will not strike fire with steel.

Burnt, it acquires a reddish brown or cinnamon colour.

This slate is found in many of the coal counties of this kingdom, and always forms vast strata above the coal. It is found in like manner over the coal in Silesia, in the duchy of Magdeburgh, and in most other places of Europe where coal is dug, and like that found in England, is also always adorned with vast variety of blackish vegetable impressions.

It is of no use that I have ever heard.

S E C T. IV. *The Red Slates.*

M E M B. I.

Slates which are not acted upon by acids.

XIII. *Schistus purpureus.*

SAXUM *fissile rubrum vel Lapis fissilis ruber.* Kentm. Nom. Foss. p. 56. N°. 8. Worm. Mus. p. 38. Grew's Mus. Reg. Soc. p. 311. Scheuchzer's Oryctogr. Helvetica, p. 108. Woodward Cat. L. γ. 10. Gronovius's Supell. Lap. p. 9. N°. 4. Bruckm. Epist. Itin. Cent. ii. Ep. 60. p. 656. et p. 658. N°. 1.

Steganium purpureum, splendidum. Hill's Hist. Foss. p. 458. N°. 1.

This slate is of a fine dark purple colour, of a very smooth and even surface, but quite destitute of brightness, considerably heavy and hard, of a fine close, compact texture, and is composed of numbers of thin plates, laid close and even on one another; water does not at all pervade its structure, and when written on, the characters are white with a slight reddish cast.

The

The surface is sometimes thinly set with a few extreme small glossy spangles, which are so very minute as not to be observed, but upon nicely viewing it, nor do they give the least brightness to the slate.

It will not strike fire with steel.

It suffers no change in the fire.

There are vast large strata of this slate in this kingdom, chiefly in Cumberland, Northumberland, and the other northern counties; in Caernarvonshire, in Wales, the hills are full of quarries of this species, and sometimes, tho' rarely, the strata of it dip almost perpendicularly, and they generally lie just beneath the common soil.

It is also dug in many parts of Europe, in Sweden, in Switzerland, and other parts of Germany, and in vast great quantities in the County of Namur, in Flanders; the houses in Dutch Brabant are all covered with this purple slate, and the green slate hereafter to be described; the strata of these different kinds lie undoubtedly near to and intermixed with each other, for I observed masses of slate partly green and partly purple, without any crack, flexure, &c. to divide them, but the colours bounded by straight regular lines as if done by a pencil, to be extremely common there, and to which country the slate is brought from the quarries of Namur.

The brown slate exhibited by Woodward, Cat. C. b. 25. which, he says, is composed of numerous infinitely thin plates, found near Aywood in Wales, and masses of it are commonly found upon the sea shore there, is probably of this species.

The *Lapis crustosus fissilis*, Boccone's Mus. di Piante Rare, Dec. 12. p. 158. which he describes as hard, thin, of a ferruginous colour, and, like common slate in consistence and constitution, is of this species; it is dug at the surface of the pits of the *Terra foliata bituminosa* (hereafter to be described) in the territory of Millilli in Sicily.

XIV. *Schistus bruno-ruber micis refertus.*

Schistus bruni coloris, particulis squammosis micaceis refertus. Append. Ephem. Nat. Curios. Vol. vi. p. 132. N°. 7. De schisto ejus indole atque genesi meditationes Sam. Theoph. Langii.

Lapis scissilis ex rubro brunus cum micis argenteis, et Lapis scissilis bruni coloris cum micis parvis. Bruckm. Epist. Itin. Cent. ii. Ep. 60. p. 658. N°. 7. & 8.

Lapis fissilis brunno-rubicundus, ut argentum felium splendens. Id. Cent. i. Ep. 47. N°. 6.

This is a coarse earthy slate, of a deep brownish red colour, of a rough surface, or without the least smoothness, but bright and glittering, with great multitudes of small spangles of a silvery talc, with which it is thick set, and it is also frequently adorned with some rude black dendritæ; it is hard and heavy, of a coarse, firm, compact texture, its plates are few in number, generally above a quarter of an inch thick, and are laid very closely and evenly on one another; water very slowly and slightly pervades its structure, and when written on, the characters are of the same colour as the slate.

It

It strikes fire freely and plentifully with steel.

Burnt, it acquires a dusky colour.

It forms large strata, which are intermixed with the strata of the *Schistus marmoreus caeruleo-cinereus*, already described p. 171.

It is also found in great quantities in some parts of Germany; at the village Laublingen near Hall, in the duchy of Magdeburg, says Langius, it is found with a reddle or red clay, and abounds so much thereabouts, that the neighbouring village of Rothenberg derives its name from these two substances. At Pyrmont, Bruckman informs us, it is dug in large masses or plates, and with it the inhabitants of that country cover their houses.

Woodward Cat. C. b. 26. exhibits a red slate, soft, friable, and of scarcely greater consistence than earth. There are numerous small micæ in it. 'Twas part of a stratum about half an inch thick, extending for a vast way (above and below were strata of common clay) in the road five miles beyond Hereford. The said slate is probably only a variety of this species.

SECT. V. *The Yellow Slates.*

MEMB. I.

Alcaline Slates.

XV. *Schistus subluteus marmoreus elegans, dendritibus nigris pulchre notatus,*

Marmor Florentinum dendriticum vulgo dictum.

AN dendrites Plinii Hist. Nat. l. xxxvii. c. 11?
Marmor de Monte Sinai, s. Pietra emboscata overo Pietra naturalmente delineata di figuri de' Boschi. Imperat. Hist. Nat. l. xxiv. c. 24. Moscardo's Mus. p. 147. Worm. Mus. p. 44. Cup. Hort. Cath. Supplem. alt. p. 52. Mercat. Met. Vat. p. 273. Mus. Cospien. p. 147.
Busby marble. Sibbald's Prod. Scotiæ, de Foss. p. 46.
Dendrites slate. Grew's Mus. Reg. Soc. p. 268.
Chorolithos. Butner's Corallogr. Subterr. p. 4.
Dendrites, Dendrophoros, Marmor Florentinum dendriticum, Dendroidæ Florentini rectius Veronenses, variorum authorum, scil. Aldrov. Mus. Metall. Rar. Mus. Bessler. à Lochnero, p. 96. Mus. Calceol. p. 419. Lachmund's Oryctogr. Hildesheim. p. 14. et seq. Kircher's Mund. Subterr. l. viii. c. 9. p. 32 et 42. Langius's Hist. Lap. fig. Helvetiæ, p. 33. Bayer's Oryctogr. Norica, p. 44. Butner's Rud. Diluv. Test. p. 125. Mylius's Saxonia Subterr. P. 1. p. 57. Scheuchzer's Mus. Diluv. N°. 98. 248. 248. et alibi passim. Id. Herb. Diluv. passim. Melle de Lap. fig. Agri Lubecensis, p. 23. Valentini Aurifod. Med. p. 42. Kundm. Prompt. p. 221. N°. 43. et seq. Id. Rar. Nat. et Art. P. 1. Art. 14. p. 134. et seq. Woodward Cat. l. x. 1. et Cat. l. x. 2. Gronovius's Ind. Supell. Lap. p. 102. N°. 5. Ritter Comment. II. de Zoolitho Dendroidis.

This species, on account of its elegant polish and beauty, has hitherto by most authors been ranked as a species of marble, but erroneously, it being of a laminated structure, and truly of the slate genus.

It is of a pale yellowish colour, adorned with very elegant and delicate black arbuscular delineations, or dendritæ, from whence it has generally obtained the name of the *Florentine dendrites marble*.

A calcareous slate, of a very fine, compact, solid texture, like a flint; its plates are generally about half an inch thick, and are perfectly even and regular on one another, and cohere pretty close. It is moderately heavy and hard, of a smooth surface, is capable of a fine polish, and water does not at all penetrate its structure.

It will not strike fire with steel.

Burnt, it suffers very little change.

This slate is dug near Florence, the chief quarries of it are about four miles from that city, and it abounds in the country all round; it is found in thin strata; and the other elegant Florentine slate, called generally *the ruined slate*, from the spots on it resembling very much the ruins of buildings, towns, &c. hereafter to be described, is found in the same quarries with this species.

It is greatly valued for inlaying all kinds of ornamental works of cabinets, tables, &c.

As the term *Dendrites* is now universally adopted by the writers on fossils, for all those beautiful arbuscular delineations found not unfrequently on many species of stones of very different genera; and as they are also frequently exhibited by most authors in a particular genus, which comprehends, in a confused and irregular manner, all those said various species of fossils, only on account of these arbuscular delineations found on them; and farther, as some authors (1) have even wrote natural histories of the dendrites, i. e. of these arbuscular delineations, without regard to the genera or properties of the fossils, on which they are found, I judge it not improper to give some account of the origin and nature of these delineations, under the description of this Florentine species, not only as it is the most elegant and beautiful of all the fossils adorned with dendritæ, but likewise that the said dendritæ, from their origin, must inevitably occur more frequently, and be more beautiful and delicate on the slates, on account of the compact texture, and lamellated structure of that genus, than on any other genus of fossils whatsoever.

The dendritæ owe their origin to mineral exhalations, which insinuating themselves between the plates of laminated stones, as also the flaws or cracks of fossils of a solid structure (whereof the parts yet cohere, and that the surfaces of the said cracks, flaws, &c. are even or smooth) branch out or expand into delineations resembling the ramifications of trees, shrubs, or plants, of greater or

(1) Chiefly Scheuchzer, De dendritis, aliisque lapidibus, qui in superficie sua plantarum, foliorum, florum, figuras exprimunt. Dissert. Epist. Append. Ephem. Acad. Nat. Curios. Ann. v. et vi. Dec. iii. Stobæus, Dissertatio sistens historiam naturalem dendritæ lapidumque cognatorum; & Alb. Ritter Commentatio II. de Zoolitho-Dendroidis in genere et in Specie de Schwartzburgico-Sondershusanis, &c.

less delicacy and beauty, according to the greater or less fluidity of the exhalations, or the grossness of their particles.

That this is the origin of these delineations, may be illustrated by a very easy experiment of pouring a liquid, especially oil, between two fine polished plates of marble, slate, or any other stone of a compact texture, compressed close together; upon parting them again, the oil will be found to have run or expanded itself into beautiful and delicate ramified tracts, exactly resembling these arbuscular delineations found on fossils of various kinds, and the oily ramifications always begin and are the perfectest on that side where the marble, slate, &c. is begun to be separated.

Experience further illustrates this assertion, by observing that the most delicate and beautiful dendritæ, are always found on the stones which are of a compact texture, and of a laminated structure; on those which are not of a laminated structure, tho' of a compact solid texture, few are found, but where the said stones (as has been observed before) are full of cracks or flaws, the parts of which yet cohere together, and have their surfaces smooth and even; but in stones of a porous or rough texture, very few dendritæ are found, and those are generally very rude and imperfect. This observation not only extends to mineral and metallic ores, to earths, sand-stones, and other fossils of a rough unequal texture, but even to the flags or laminated sand-stones, tho' of a laminated structure.

The slates therefore being the fossils on which the dendritæ most frequently occur, and are the most beautiful, the most curious dendritæ exhibited by authors are on that genus of stones, and the chiefest varieties mentioned by them are this Florentine kind; the Eichstadt, Pappenheim, and Osnabrug kind, already described p. 169. those of Salsfeld, Jena and Sangershausen, in Thuringia; of Sula, and Ilmenau, in the county of Henneberg; of Glatz, in Bohemia; of Saxony, and of several other parts of Germany.

In England few very curious dendritæ occur; the *Lapides septarii*, hitherto called *Ludi belmontii*, are frequently adorned with slight arbuscular delineations, and the like delineations also occur pretty frequently on cracked pebbles and flints, and sometimes rude delineations are found on the common slates.

On marble, sand-stones, ores, &c. few dendritæ are found; on the indurated soap earths they sometimes occur, but on the fossil shells which are found in the strata of chalky substances, and are like calcined shells, and on the fossil bones of animals, especially the *ebur fossile*, or elephants teeth, elegant and delicate dendritical delineations are frequent between the lamellæ or plates, to the formation of which, no doubt, the lamellar structure of these bodies greatly contribute.

The arbuscular delineations and the grass, moss, &c. like appearances frequent on the Mocho stones, agate, and other stones of that genus, and from which they have obtained the name of *Dendrachata*, when these delineations proceed not from real grass, moss, &c. of which the instances are extremely rare, owe their origin to the same cause as the other dendritæ; but the substances which form them, being generally of a coarse terrestrial nature, and not so fine as the mineral exhalations which form the others, it thence proceeds, that the delineations on the Mocho stones are generally small, and not often adorned with any great number of delicate ramifications,

and those on the agats are always coarse and carry a visible body with them.

The plumose appearances which sometimes occur in the *Selenitæ*, may likewise be ranked as a kind of dendrites, the origin of them being analogous to the origin of those bodies, the substance which forms them, and which is generally a clayey or other earthy substance, of the same kind as the strata in which they are found imbedded, being carried by the waters into the interstices between the plates of that fossil, where the particles being too gross to be held up in the water, and afterwards to be precipitated into fine ramifications, and the structure of the plates of the *Selenitæ*, being composed of straight filaments, the earthy parts are of consequence more readily deposited in straight lines, and not in ramifications; and are accordingly found from a main stem only, running into oblique lines like the feathers on a quill, and remain thus fixed in that figure by the evaporation of the fluid.

The colours of the dendritæ are chiefly black or blackish, also red, yellow, and brown, but very rarely greenish; according to the nature of the mineral exhalations which form them, these colours are sometimes all blended together on one delineation, at other times the larger stems or branches are black, the smaller ramifications yellow or brown, and *vice versa*; and it is not very uncommon to find a plate on which the dendritæ of the opposite surfaces are of different colours, and even sometimes one surface of the plate is adorned with extremely elegant and delicate ramifications, which on the other surface degenerate or form only spots or rude stellar figures, all which differences or varieties may be easily accounted for from the principle of their formation.

The delineations in some dendritæ are not taken away by fire, others immediately disappear, some are superficial, others penetrate the stones, all which varieties very frequently occur in dendritical stones even of the same kind.

Experience demonstrates to us, that the mineral exhalations which form these delineations, are not of one, but of several kinds, *viz.* from vitriolic, bituminous, ferrugineous, and cupreous particles; the experiments which have been made on these delineations, prove the existence of all the said mineral principles; sometimes the stones on those places where the dendritæ are most plentiful, are greatly corroded, which seems to imply the presence of a saline or vitriolic substance, joined to the metallic exhalation; that a bituminous substance is often their origin, is strongly elucidated by the experiment Schroe-kius made: The said author took a dendrites fresh dug, and having with great care scraped all the black or dendritical substance from it, on applying it to the fire it immediately flamed, and emitted a strong bituminous smell; numbers of experiments prove the existence of the irony or ferruginous exhalations, and in regard to those of a cupreous nature, which are very rare, and always greenish, Bruckman informs us, that all the dendritæ which are found in the neighbourhood of the Rammelsberg Mountain, and near Goslar, which abounds with veins of copper, are only of that colour.

SECT. VI. *The Blue Slates.*

MEMB. I.

Slates which are not acted upon by acids.

XVI. *Schistus cæruleus.*

ARDÉSIA vulgaris, f. *Saxum fissile cæruleum, vel Lapis scissilis et crustosus, et Lapis fissilis. Slate.* Kentm. Nom. Foss. p. 56. N°. 7. Worm. Mus. p. 38. Merret's Pin. Rer. Nat. Brit. p. 212. Phil. Transf. N°. 50. Woodw. Meth. of Foss. p. 10. N°. 33. Id. Cat. C. b. 16, 17, 18, et 21. et Cat. G. b. 13. Dale's Pharm. p. 45.

Fissilis durus, cærulescens, clangosus, Ardesia tegularis. Wallerius's Mineralogy, Spec. 66.

Schistus nigro-cærulescens, clangosus, Ardesia tegularis vulgo. Linnæus's Syst. Nat. p. 154. N°. 1.

Steganium subcæruleum. Hill's Hist. Foss. p. 458. N°. 1.

This is of a greyish blue colour, of a smooth even surface, moderately heavy and hard, of a fine compact texture, and is composed of numbers of thin plates laid very regular and even, and are easily divisible; water does not pervade its structure, and when wrote on, the characters are whitish.

It is too soft to strike fire with steel.

Burnt, it acquires a brownish colour.

It is dug in great quantities in many parts of England and Wales, and is a well-known and useful stone for the covering of houses.

It is also dug in great quantities in most parts of Europe, but the English slate is held in the greatest esteem, and quantities of it are yearly exported: those of Caernarvonshire in Wales, as being more durable and light, are principally held in repute; and it is affirmed that about five millions of slates, which amounts to above five thousand pounds sterling value, are yearly shipped from Caernarvon bar only, for some parts of England and Ireland.

To judge of the goodness of slate, Mr. Colepress, in the Phil. Transf. orders it to be knocked against any hard body, to make it yeild a sound: if the sound be good and clear, the stone is firm and good; otherwise it is crazy. Another method of proving its goodness, is, by weighing it exactly, then letting it lie six or eight hours under water, and wiping it very clean, if it weighs more than it did before, it is of that sort which soaks in water, and therefore will not long endure without rotting the laths and timber.

Perpendicular and other fissures, in all bearings and directions, are generally very thick and frequent in the strata of this slate.

It is very remarkable, that all the grounds round Dynasmundhwy, a village in Merionethshire, abound with small nodules of this slate, worn smooth and rounded at the edges by the waters; even on the high hills thereabouts these nodules are frequent, which, as they are out of the reach of accidental floods, rivers, &c. seem to have received their present form at the time of the general deluge.

The

The *Rumpley stone*, exhibited by Dr. Grew, Mus. Reg. Soc. p. 311. which he describes to be in colour and substance like the common blewish slate, but excels it, in that it rises large enough for building, and can be cleft into very thin plates, is only a variety of this species.

Dr. Woodward, Cat. L. 711. exhibits a variety of this species from the East Indies, where it is called *Affa poory*, and of which the powder is used in fumigations for children, when they get cold.

SECT. VII. *The Green Slates.*

M E M B. I.

Slates which are not acted upon by acids.

XVII. *Schistus viridis.*

SAXUM fissile in cinereo Glaucum. Kentm. Nom. Foss. p. 56. N°. 6.

Saxum fissile in cinereo viride. Worm. Mus. p. 38.

Schistus viridis scriptura alba. Mus. Tessin. p. 18. N°. 7.

This slate is of a fine agreeable sea green colour, of a smooth surface, heavy, not hard, and much softer than either the blue or purple kinds; it is of a moderate fine texture, and is composed of numbers of thin plates, which are laid pretty even and regular, but very loosely, and are very easily separable from each other; water does not at all penetrate its texture, and when written on, the characters are white.

It is too soft to strike fire with steel.

Burnt, it acquires a purple colour, and some hardness, and exactly resembles the purple slate.

It is dug in Cumberland, and in some other parts of England and Wales; I also observed great quantities of it in Dutch Brabant, along with the purple slate, and intermixed with it, as is fully set forth under the description of that slate p. 175. *supra*.

It is also dug in Sweden, and several parts of Germany, and is used with the other kinds for slating of houses.

Its acquiring a purple colour when burnt, and its great resemblance then to the purple slate, and also its being found intermixed with masses of that slate, as is already fully observed, *l. c.* might create a suspicion, that this and the purple slate are not, in *rerum natura*, intrinsically different species of slate, but that the purple kind owes its origin to this species, which acquires that colour and hardness, by heats, exhalations, or other subterranean causes.

SECT. VIII. *The variegated Slates.*

MEMB. I.

Alcaline Slates.

XVIII: *Schistus Florentinus variegatus, regiones desolatas et ædificiorum rudera affabre præ se ferens.*

LAPIS vel Marmor Florentinum variegatum rudibus urbium ædificiorumque ornatum. Kircher's Mund. Subterr. l. viii. c. 9. p. 32. Worm. Mus. p. 44. Lachmund's Oryctogr. Hildesheim. p. 14. Septalius's Mus. Ol. Jacob. Mus. Reg. Dan. p. 37. Valentin. Aurifod. Med. p. 42. Id. Mus. Museor. P. 1. c. 21. p. 55. Woodward Cat. L. x 2 and 3. Bromel's Lithogr. Suecana, c. 5. Kundm. Promt. p. 214. N^o. 75. a 33. Mus. Richt. p. 196. Gronovius's Ind. Supell. Lap. p. 7. N^o. 29. Ritter's Comment. ii. de Zoolitho-dendroidis, aliorumque authorum.

A Florentine Slate. Grew's Mus. Reg. Soc. p. 311.

Marmor picturæ rudimentis ornatum, s. Marmor figuratum Florentinum. Wallerius's Mineralogy, Species 46.

Graptolithus. Linnæus's Syft. Nat. p. 203. N^o. 2.

This species, as well as the dendritical Florentine slate, already described, from its polish and beauty has hitherto been reckoned as a species of marble by most authors.

This slate is of a fine compact but irregular texture, on account of the many different earthy substances which form its spots or veins; it is heavy, moderately hard, and generally is composed of plates about half an inch thick, these plates are laid even and regular on one another, and cohere pretty close; it is of a smooth even surface, is capable of a fine glossy polish, and water does not penetrate its substance.

Its colour is generally a pale yellowish brown, which is thickly and elegantly variegated, with spots of different shades or degrees, of a deep reddish brown colour. These shades of colour are in a beautiful manner divided, as it were into pannels or compartments by streight lines, or rather fine cracks or flaws in the stone; the spots generally rise from one of the ends of the plate, as from a ground or surface, and run towards the middle of it, in irregular lengths or heights; and being irregular, and of various sizes and shapes, with the help of the imagination, very prettily but rudely represent desolate places, ruins of castles, towers, towns, &c. from whence it has generally obtained the name of the Florentine ruined marble: sometimes that upper part of the stone, which is not variegated with brown, has different circular shades of the ground colour, not unaptly resembling clouds, and renders the imaginary prospect more elegant.

The other chief varieties of this stone, which I have hitherto observed, are 1^o. With the ground of a very pale ash colour; 2^o. Of a pale greenish brown ground; this variety generally is thick set with very small deep brown
and

and light brown spots, as it were alternately laid; and 3°. Of a pale brown ground, with elegant shades of a pale rose colour, and the spots of a deep yellow colour, which are divided by great numbers of lines; the spots in this variety are not many, nor are they so irregular, as to form such pretty imaginary ruins, which the other kinds are adorned with.

The spots of this stone, which quite pervade it, are in reality veins and lumps of very different stoney and earthy substances, and slight veins of a whitish glittering spar often intersect it in various directions.

It will not strike fire with steel.

Burnt, it scarcely suffers any change.

It is dug in the same quarries near Florence, as the dendritical kind already described, p. 177. and there are also strata of it about Firenzuola, in the Appennines, about twenty miles north west of Florence.

It is greatly esteemed, and used for inlaid works, cabinets, tables, &c.

S E R I E S II.

C H A P. III. G E N U S I.

Stones found forming continued strata, bright and beautiful, of very lively colours, and of a constitution so fine, that they will readily take a good polish; the stones of this genus are moderately hard, always ferment with acids, and burn to a lime.

D I V I S I O N I. *Marbles of one plain colour.*S E C T. I. *The Black Marbles.*I. *Marmor nigrum.*

TH E *Namur marble of authors.*

Marmor nigrum Belgicum. Kent. Nom. Foss. p. 54. N^o 1.

Marmor durissimum, nigrum, scintillans; quod Marmor Luculleum antiquorum. Hill's Hist. Foss. p. 465. N^o 2.

This marble is of a good deep black colour, of a fine, compact, solid texture, or not composed of any distinct granules, and somewhat bright or sparkling, it takes a fine glossy polish, is very heavy, and considerably hard, but will not strike fire with steel.

Burnt, it acquires a white colour.

There are vast quarries of this marble near the city of Namur, in French Flanders, from whence great quantities are carried to most parts of Europe, and from its being brought us thence, it has obtained the name of Namur marble with our masons.

It is also found in many parts of Italy and Germany, and is a very common marble; in this kingdom it is dug in large quantities near Ashford in Derbyshire, and, as I am credibly informed, also near Pendle Hill in Lancashire.

The *Marmor Luculleum* of the antients, so called, as Pliny informs us, l. xxxvi. c. 6. from the Consul Lucullus, who first brought it into use in Rome, and which was dug in Egypt, was probably this species of marble, for the pieces of antient black marble, likely the *Marmor Luculleum*, now found amongst the ruins at Rome, and which the Italians call *Nero Antico*, prove to be this very species of marble.

It is chiefly used for monuments, tombstones, and on other such occasions.

II. *Marmor Nigrum splendentis polituræ, s. Lapis Obsidianus antiquorum.*

Lapis obsidianus. Hill's Theophrastus, p. 21, 24. 25. Pliny's Hist. Nat. l. xxxvi. c. 26. Agricola de Nat. Foss. l. iv. c. 5. p. 474. Cæsalpin. de Metall. l. ii. c. 13. Boet. de Boodt. de Gemm. et Lapid. l. ii. c. 91. 163 et 272. Aldrov. Mus. Metall. p. 750. Salmasius in Solinum, p. 204. De Laet de Gemm. et Lapid. l. iii. c. 25. Mus. Calceol. p. 380. Worm. Mus. p. 42, 43. Kundm. Prompt. p. 186. r. 132. Mus. Richter. p. 187 et 192.

Marmor obsidianum, the Touchstone. Charlt. de Foss. p. 245. N°. 2.

Marmor durissimum, nigrum, levissimum, hebes; quod Marmor Chium, et Lapis obsidianus antiquorum. Hill's Hist. Foss. p. 466. N°. 3.

This is of a fine glossy black colour, of a close, compact, solid texture, or composed of no visibly distinct particles, perfectly smooth where broken, and dull or quite destitute of any glittering or brightness; it is very heavy and hard, and cuts very difficultly, but extremely smooth and even, and is capable of the highest polish of any of the marbles yet known.

It will not strike fire with steel.

Burnt, it acquires a white colour.

The antients brought this elegant marble from the Upper Egypt, and from Æthiopia, and Pliny informs us, that it was also said to be found in India, in Italy, and in Spain. Cæsalpin affirms it to have been dug in his time at Saravezza and Carrara, in Tuscany; but at this present time we know of no quarries of this stone, and the pieces of it which we have are generally dug from amongst the antient Greek and Roman ruins, but probably it is found in the Empire of China, and some other parts of the East Indies, for I have often seen pieces of it from that part of the world.

D'Argenville Tentam. Enum. Fossil. Galliæ, p. 118. informs us, that in the County of Roussillon in France, not far from *Notre Dame del Coral*, near the place called *Col d'Ares au Valspic*, very hard stones of a most splendid glossy black colour, even without having been polished, are found; these stones are probably fragments of this kind of marble, broken off from strata in that country, which are not yet discovered.

It is sometimes used by the statuaries, but it was chiefly famous amongst the antients for making reflecting mirrors, which the high and elegant polish it is capable of, makes it extremely fit for. It indeed derived its name from this quality, for the name *Obsidianus* was no other than a false spelling of *Op-sianus*, as Salmasius and Hill have judiciously observed.

III. *Marmor nigrescens.*

The ground of this marble is of a fine slight iron black, or greyish black colour, but it is not uniform, being variegated with streight veins of a lighter shade, in a very pretty manner. It is of a coarse granulated texture, very glittering and bright, and takes a very fine glossy polish, is heavy and hard, but does not strike fire with steel.

I am informed this marble is dug in Norway.

OBSER-

OBSERVATIONS on BLACK MARBLES.

Most black marbles stink when struck or rubbed with iron, which foetid smell, as also their black colour, proceeds chiefly from bituminous and sulphureous principles. Various black marbles, on account of their smell, have been exhibited by authors as peculiar species, thus Kent. Nom. Foss. p. 54. N°. 4 and 5. mentions a Belgic black marble, which stinks like sulphur; and another Belgic black marble, which smells like burnt horn; a black marble, smelling like the latter, is also mentioned by Lachmund Oryctogr. Hildesheimensis, p. 16. to be found in the bishoprick of Hildesheim. Bruckman, in the Breslau Phil. Transf. Anno 1725. Class. iv. p. 148. and in his Epist. Itin. Cent. i. Ep. 59. p. 4. and 95. p. 7. describes a hard stinking black marble, found plentifully in the County of Orawa or Arvens in Hungary, which in the Slavonic language, is called *Cferni Kamen*, and is used with great success in all diseases of swine, when beaten to powder and given to them in their drink. The said author, Ibid. Ep. 13, and 53. p. 5. further mentions a sepulchral monument in St. Catherine's Church in the city of Brunsvic, which is of a very hard black marble, set with bright spangles, which when rubbed or even only scratched, emits a most disagreeable foetid sulphureous smell.

Among the marbles of the antients, besides the *Lucullean* and *Obsidian* already described, the *Alabandicum* was a black marble, as were probably also the *Chium* and *Tænarium*.

The black marbles now dug in Germany, are at Ratibon, at Steinach, in the duchy of Coburg (1), and at the village Belem, a mile from the city of Osna-brug (2), at Franckenstein in Silesia (3), and in some parts of Carniola (4), between Aigle and Olon, in the Canton of Bern, on the Rinzenhoren, by the village Lintthal, in the Canton of Glaris, in the Tiraner Territory, in Welt-lein, in Pundten, and on the Wettinger Mountain, in the county of Baden, all in Switzerland (5); near the city of St. Pons in Languedoc, at the village Framayes, near the city Montbart in Burgundy, near the city Charleville in Champagne, and near the city of Salins in la Franche Comté, all in France (6); and Imperatus (7), also mentions a black marble, which bears a good polish, to be dug at Carrara in Italy.

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| (1) Bruckm. Epist. Itin. Cent. i. Ep. 25. p. 9. N°. 1. et Magnalia Dei, &c. P. II. p. 230. | (4) Bruckm. Magn. Dei, &c. P. I. p. 65. |
| (2) Bruckm. Epist. Itin. Cent. i. Ep. 25. p. 7. | (5) Scheuchzer Oryctogr. Helvetical |
| (3) Wolkm. Silesia Subterr. p. 38. | (6) Argenville Tentam. Enum. Fossil. Galliae. |
| | (7) Hist. Nat. l. xxv. c. 8. |

S E C T. II. *The White Marbles.*IV. *Marmor candidissimum quod Marmor Parium et Lychnites antiquorum.*

HILL's Theophrastus, p. 21. Strabo's Geogr. l. x. Pliny's Nat. Hist. l. iv. c. 12. and l. xxxvi. c. 5. Gesner de fig. Lapid. p. 52. Cæsalpin de Metall. p. 89. Aldrov. Mus. Met. p. 748. Salmasius in Solin. p. 129. Imperat. Hist. Nat. l. xxv. c. 8. Boet. de Boodt de Gemm. et Lapid. l. 2. c. 267. Laet de Gemm. et Lapid. l. ii. c. 25. Worm. Mus. p. 42. Charlt. de Foss. p. 244. N^o. 1. Tournefort's voyage to the Levant, Vol. i. Lett. v. p. 156. Mercat. Met. Vat. p. 354. Mus. Richter. p. 186.

Marmor album, splendidissimum, densius: quod Marmor Parium antiquorum.
Hill's Hist. Foss. p. 461. N^o. 1.

This is a very elegant marble, of a fine white colour, and capable of a most perfect and bright polish; it is moderately hard and heavy, and extremely bright and dazzling where broken, on account of the particles which it is composed of, which are flat, moderately large, and like grains of salt, and cohere pretty firmly together; it cuts freely, but is apt to fly in little bits, and give false lights by the glittering of the grain; water does not at all pervade its pores, it will not strike fire with steel, and it calcines to a snow white colour.

This marble, by the inaccuracy of authors, has been generally confounded with another marble, called by the Italians *il Saligno*, or *Marmo Greco Saligno*, as also with the Carrara marble, hereafter to be described; but the differences of these three species of marble are very evident, if examined together. Hill however seems to confound the Parian with the Saligno, when he describes it to have generally some admixture of a faint blueish cast, and frequently to be veined with blue streaks of different breadths, but that is never observable in the true Parian marble, which is always of a pure white throughout, whereas the *Saligno* marble has some admixture of that colour.

The Parian by the antients was esteemed the first and finest of all marbles, for the statuaries use, and was in so high esteem, that it is frequently celebrated in their writings. Antiquity is even divided, whether to give the origin of its name from the island of Paros, where it was dug, or to the Sculptor Agoracritus Parius, who first ennobled it by a statue of Venus cut of it. The latter opinion, however, seems the most probable, as this marble is far from being peculiar to the island of Paros, for it is no less common in the islands of Naxos, and of Tinos, where are large quarries yet extant, but those islands wanted men of skill to work upon it, and bring it into the repute, that the sculptors and skillful architects of Paros had done, by which it grew so celebrated, that the most famous sculptors used no other; and Pliny, l. xxxvi. c. 13. even tells us, that it was sent for from Egypt, to adorn the frontispiece of that celebrated Labyrinth, which was counted one of the wonders of the world.

Tho' the Grecian islands yet abound with this famous and valuable marble, yet it has never been in use ever since the decline of the Roman Empire, in those

those parts. Some modern authors indeed, advance its being yet used by statuary, but it is a gross error, and the marble has suffered the same fate as its first ennoblers, for the true Parian marble is hardly known, the quarries being not now worked, nor is any of it ever brought from thence, and only rough blocks of it, as hewn out of the quarries, are sometimes found in the ruins at Rome.

Amongst the many famous statues of antiquity cut of this marble, the valuable and elegant statue of Laocoon and his two sons, mentioned by Pliny, l. xxxvi. c. 5. has escaped the injuries of time, and is yet preserved at Rome, as are also three other elegant statues of this marble, of Apollo, Antinous, and the trunk of a statue, supposed to have been of Hercules, which is called by the common people *il Torso*.

The Lychnites marble of the antients, was the same as the Parian, under another name, as was also perhaps the Lygdinum, tho' that cannot certainly be determined. It had its name Lychnites, as Varro and Pliny inform us, from its being hewn in the quarry by the light of lamps, from *λυχνίς* a lamp; and tho' they are generally followed in this etymology, yet, as it is not at all peculiar to those quarries to have been worked by lamps, candles, or other such lights, but is likewise common to all great quarries, &c. I cannot but think the etymology which Hill has given us much more natural, *viz.* from the verb *λυχνέειν*, to be very bright or shining, as the brightness and splendor of this marble was ever its distinguishing character.

Mr. Tournefort observes, that the quarry of marble in Provence, between Marseilles and les Pennes, seems to be of the same grain with the Grecian marble. I am further persuaded, that some of the white marbles found in Germany, France, &c. if duly observed, will also prove to be of the very same species as the Parian marble.

V. *Marmor album salinum dictum.*

Marmor Greco Saligno. Imperat. Hist. Nat. l. xxv. c. 8. Mus. Richter. p. 190.

This marble is of a diluted milky colour, but generally with some slight admixture of a smoaky and rusty hue; it is heavy, much harder than the Parian, and bears the injuries of the weather to perfection, and when struck with steel or iron has a sulphureous smell. Its texture is granulated, coarse, and not very compact; the granules are much larger than those of the Parian marble, are perfectly bright, glittering, and semi-pellucid, and exactly resemble grains of salt (from whence this kind has particularly obtained the name of *salt marble*) and very often form fine lucid spots or specks in its substance; it is capable of a very fine glossy polish, and will not strike fire with steel.

The authors who mention this marble, and all the specimens of it I have seen, agree in calling it a Grecian marble, but upon what foundation does not appear.

VI. *Marmor*

VI. *Marmor candidum Lunense, f. Carrariense.*

Pliny Hist. Nat. l. xxxvi. c. 5. Kentm. Nom. Foss. p. 53. N^o. 1, 2. Cæfalpin. de Metall. p. 89. Imperat. Hist. Nat. l. xxv. c. 8. Mus. Richt. p. 186. and 190.

Marmor Ligustrium. Aldrov. Mus. Met. p. 748.

Marmor candidum, Italicum Carrariense; Alabastritæ fere genus; Olim Lunense. Gimma, p. 8.

Marmor albissimum durius: Marmor Lunense antiquorum. Hill's Hist. Foss. p. 463. N^o. 2.

This marble is of a fine perfect white colour, heavy, and considerably hard, and when struck with iron, has a sulphureous smell; its texture is granulated, the granules are extremely white, bright, and glittering, not large or coarse, and very closely and firmly concreted together; it is more transparent than the other white marbles, and is capable of a very elegant polish. It will not strike fire with steel; burnt, it nearly retains its colour, but is soon acted upon by the force of the fire, and crumbles readily into granules like poppy seeds, and for that reason does not bear well (says Imperatus) the injuries of the weather, and the lime it also yields, is but of a very indifferent quality.

The quarries of this marble are at Carrara in Italy, the strata are very thick and large, and are generally of this fine white kind, which for its excellency for the statuaries use has by preeminence obtained the name of statuary marble, or *il Statuario*: however, large blocks or spaces in the strata, are also found veined with some veins of a slight black or greyish blue colour, and then it changes its name, and is commonly called *il Aurenato*, overo, *Bardiglio di Carrara*.

Many authors have confounded the Parian and Carrara marbles together, and made them as one species, but the Carrara marble is of a finer and more compact structure, of a much whiter colour, but less bright and splendid, and not capable of so glittering a polish, and it is also much harder to cut than the Parian marble.

VII. *Marmor album quartum.*

This marble is near opaque, of a fine pure bright white colour, and has sometimes a few small specks of black; it is hard, heavy, of a fine firm compact granulated texture, the granules are irregular, moderately large, very dazzling and near pellucid; it admits an admirable polish, and is a very elegant marble.

It will not strike fire with steel.

The quarries of this marble are at a place called Vaudier, in Piedmont.

VIII. *Marmor*

VIII. *Marmor albescens.*

This marble is semi-transparent, of a cream-white colour, with a very slight reddish cast, it is of a coarse granulated texture, the particles are irregular, very bright, glittering, and transparent, and cohere but slightly; it is heavy, moderately hard, and cuts freely; it admits a fine glossy polish, and is a very beautiful marble.

It will not strike fire with steel.

The quarries of this marble are at a place called St. Martins in Piedmont.

IX. *Marmor ebori simile, quod Chernites antiquorum.*

Chernites. Hill's Theophr. p. 23. Plin. Hist. Nat. l. xxxvi. c. 17.

Marmor candidum ebori simile. Agricola, De Nat. Foss. l. vii. Kentm. Nom. Foss. p. 53. N^o. 7. Lachmund Oryctogr. Hildesheim, p. 16. Mylius's Saxonia Subterr. P. I. p. 77. Scheuchzer's Oryctogr. Helvetica, p. 123. Mus. Richter. p. 197.

Marmor ebori simile Arabicum. Kentm. Nom. Foss. p. 53. N^o. 8.

This marble, which is now generally supposed to be unknown to us, exactly resembled ivory, which is all the description the antients have left us of it; it was used in the sepulchres of the Greeks, &c. and Theophrastus, and from him Pliny, inform us, as an historical circumstance, that Darius, the Persian monarch, was said to be buried in a tomb of this marble.

Tho' this marble is known to several modern authors, yet we are not more fortunate in having any further description, than its resemblance to ivory given of it by them. Agricola informs us, it is dug in the Bishoprick of Hildesheim in Germany, and Lachmund copies him: Kentman and Richter (the latter an author yet living) even exhibit specimens of it from that country: Scheuchzer mentions a pale marble exactly of the colour of bones, to be found in the Canton of Bern; and Mylius informs us, that a white marble, exactly like ivory, has been formerly dug in great quantities, in several of the silver mines of the district of Annaberg in Saxony, and that not only the Alter, but also the Electoral Chapel, in the city of Meissen, in Misnia, is built of this marble.

The *marmor Coraliticum* of the antients, seems also to be this species of marble, or a variety of it. Pliny, l. xxxvi. c. 8. describes it to be white like ivory, and even somewhat resembling that substance, that it was dug in Asia, and was only found in masses or blocks, not exceeding two cubits in bigness; and Agricola, De Nat. Foss. p. 630. thinks it was so named, on account of its being found near to the river Coralius, otherwise Sangarius in Phrygia.

The *Lapis Arabicus* or *Arabus* (as it is also sometimes called) of the antients, might reasonably be ranged under this same species of marble. Kentman l. c. seems to be of this opinion. Theophrastus, p. 51. who first mentions it (by the name, as is supposed, of Diabarus, which De Laet and Hill correct to Arabicus) only says it is a stone, which when it has passed the fire, assumes the form of a pumice; but Dioscorides and Pliny, l. xxxvi. c. 21. describe it

as a stone resembling ivory, which when burnt, becomes porous and friable, and was used as a dentrifice.

However, authors seem to be of different opinions, in regard to the *Lapis Arabicus*, as Gesner (1), and Cæsalpinus (2), who think it is the *Ebur fossile*, or fossil ivory. Encelius (3), who takes it to be the *Lapis specularis*, or *Glacies Mariæ*; and Hill (4), who seems to think it of the pumice kind; yet Pliny (5) affords a further proof of its probably being a marble, in his description of the *Arabica Gemma*, which he says is entirely like ivory, and would be taken for it, if its hardness did not undeceive one. For Salmasius (6) judiciously remarks, that the *Arabicus* or *Arabica* of Pliny, were probably one and the same stone, he calling it *Arabica* in that place, as relative to *Gemma* and *Arabicus*, before as relative to *Lapis*, which custom Pliny (adds that learned critic) is often guilty of, when he has transcribed from different authors, and described the same substance in different places.

OBSERVATIONS ON WHITE MARBLES.

The white are the softest of all kinds of marble, and obey the chizze! better, it is on that account that they are preferred above all others, for the use of the statuary and architects.

The white marbles of the antients now unknown to us, are the *Porus*, which in colour and hardness emulated the Parian marble, but was remarkable for its lightness, in which, it resembled the porous or tophus sand stone, and from which property it obtained its name. The *Lygdinum*, which some late authors confound with the white alabaster, and others with the Parian marble, Pliny, l. xxxvi. c. 8. says it was not much different from the *Alabastrites*; and that it was found in blocks or masses of the bigness of goblets or troughs, on the mountain Taurus; that it was fetched before only from Arabia, and was of a fine pure white colour. Chardin, in his Travels to Persia, mentions a fine kind of transparent white marble, which is yet found on Mount Taurus, but by his description it seems to be an alabastrine spar; however Bruckman, Epist. Itin. Cent. ii. Ep. 25. p. 236. N°. 24. and Supplem. ad Cent. ii. p. 1160. exhibits a specimen of a *Marmor candidum pellucidum Montis Taurinensis*, which he avers to be absolutely of the genus of marbles; this latter may probably be the *Lygdinum marmor*. The Pentelican and the Hymettium are also reckoned by the Mus. Richter, p. 186. to have been amongst the white marbles of the antients.

(1) De fig. Lap. p. 151.

(2) De Metall.

(3) De re Metall. l. iii. c. 17.

(4) Theophr. p. 51.

(5) l. 37. c. 10. Ebori simillima est et hoc videretur nisi abnueret duritia, &c.

(6) Ad Solinum p. 565. nec dicendum

diversos esse lapides Arabicum et Arabicam, nam Arabica dicitur cum subintelligitur Gemma, Arabicus autem cum Lapis, et sic solet Plinius, dum diversos sequitur, eandem rem alio atque alio loco referre.

White marble has not as yet been discovered in any part of England : in Scotland, according to Sibbald (7), some is found. There are many quarries of white marble in several parts of Italy. In Switzerland (8) it is found in the prefecture of Baden ; at Tiran in Pundten ; at Schafftlen, Gutenthann, near the Fortrefs Biberstein, and near la Sarraz, in the Bailiwick of Romain Motiers, in the Canton of Bern ; in several parts of Germany ; in the duchy of Altenburg (9) ; it is very common, near the city of Wonfiedel, in the Margraviate of Bayreuth (10), there are many quarries, the city is partly built with white marble, and they even use it in their common walls ; at Cretzschmar in Saxony (1) ; on the Rommelsberg, in the Bailiwick of Priborn, in Silesia (2), of which there are many fine monuments in the cathedral of Breslau, and the castle of Ohlau is likewise built with it. In France (3) there are white marbles dug in the Pyrænean hills near the city of Bayonne, near the city of St. Pons in Languedoc, and at the village Solutrè, near the city Maçon in Burgundy.

S E C T. III. *The Ash and Grey Marbles.*

X. *Marmor cinereum.*

MARMO Bigio à Pardiglio. Imperat. Hist. Nat. l. xxv. c. 8.

Marmor cinereum antiquum, Palumbinum dictum. Mus. Richter. p. 192.

Marmor unicolor Venetum, Marmor palumbinum. Wallerius's Mineralogy, Species 44. N°. 8.

This is of a pale blueish greyish ground, but the colour is far from being quite uniform or plain, as it is disturbed by shades of a slight red and pale white, it admits a good polish ; is moderately heavy, cuts very free, is of a fine firm granulated texture, and its granules are very bright and glittering.

It will not strike fire with steel.

It burns to a white colour.

The Mus. Richter. l. c. exhibits also a *Marmor Carrariense, lividum fere, et Pardalium dictum*, which probably is this kind, as it is dug at Carrara in Italy.

(7) Scot. Illustr. P. II. l. iv. c. 3. (1) Mylius's Saxonia Subterr. P. I. p. 79.

(8) Scheuchzer Oryctogr. Helvetica. (2) Wolkman's Silesia Subterr. p. 37.

(9) Kundman's Promt. p. 202. N°. (3) Argenville Tentam. Enum. Foss. Gallia. p. 30.

(10) Bruckman's Epist. Itin. Cent. i. Ep. 24. p. 5. N°. 24. and p. 8. N°. 61 and 62.

XI. *Marmor cinereum alterum.*

Ash coloured marble. Smith's Nat. and Civil. Hist. of the county of Cork, Vol. ii. p. 376.

This is a fine smooth marble, of an ash colour, of a firm texture, and glossy, but not glittering; it will not strike fire with steel, and burns white with a mixture of grey.

This marble is found on the lands of Carigaline, five miles south of Cork, in Ireland.

OBSERVATIONS on the ASH and GREY MARBLES.

Kentm. Nom. Foss. p. 53, N^o. 1. exhibits an ash coloured marble, which, when rubbed or struck, smells like burnt horn.

Ash coloured and grey marbles are dug in England, at Pristine in Wales (4), where it is the common lime stone, and, as it is said, in Gloucestershire (5); in Carniola (6); in Germany, at Seidelsbruch and Giegen; near Hof, a town in the Margraviate of Bayreuth (7), there are quarries of a fine marble clouded with dark and light grey; it takes a most elegant polish, and with it they pave the roads and build walls; and a whitish grey marble is dug at Wonfriedel, a city in the same Margraviate; in Saxony (8), a blackish grey marble, at and Pirna a whitish grey marble is found; in Switzerland (9), at Beckenriedt in the Canton of Unterwalden; and in France (10) there is a quarry of grey marble, in the mountains near the city of St. Pons, in Languedoc.

SECT. IV. *The Brown and Red Marbles.*XII. *Marmor rubrum.*

MARMOR *rufum* v. *Rosso Antico*. Imperat. Hist. Nat. l. xxv. c. 8. Mus. Richter. p. 191.

Marmor unicolor rubrum. Wallerius's Mineralogy, Species 44. N^o. 4.

This marble is of a purplish brown red colour, of a solid uniform and moderately fine texture, and very bright and glittering, where broken; it

(4) Woodw. Cat. C. b. 30.

(5) Marmor Anglicum griseum Gloucestershe. in the Plotian Cabinet at Oxford Caps. 11. N^o. 27.

(6) Bruckm. Magn. Dei, Vol. i. p. 65.

(7) Bruckm. Magn. Dei, Vol. ii. p. 146.

Id. Epist. Itin. Cent. i. Ep. 24. p. 5.

N^o. 25 and 29.

(8) Mylius's Saxonia Subterr. P. I.

p. 79.

(9) Scheuchzer's Oryctogn. Helvetica, p. 125.

(10) Argenville Tentam. Enum. Foss.

Gallia, p. 66.

admits a good polish, and is a very fine marble, is moderately heavy, does not strike fire with steel, and burns to a pale brownish colour.

It is an Italian marble. Scheuchzer Oryctogr. Helvetica, p. 123. mentions it to be found in the Canton of Bern in Switzerland, and I have been shewn samples of this very marble, which were affirmed to me to have been dug in England.

Kentm. Nom. Foss. p. 54. N^o. 3. mentions a Ratifbon red marble, which likely is of this species, as is perhaps also his plain coloured Egyptian porphyry, l. c. N^o. 1. which he places as a different kind of marble from the true porphyry.

XIII. *Marmor rubrum alterum.*

This marble is of a clear red, between a brick and flesh colour; it is not plain or uniform, but the colour is greatly disturbed, and forms itself into clouds, which are bounded by deeper shades of the same colour, and sometimes also it has a few small spots and veins of an opaque milk white spar. It admits a fine polish, and is an elegant marble; its texture is very fine, compact, and solid, and not destitute of brightness; it is heavy, and will not strike fire with steel.

This is an Italian marble.

Bruckm. Magn. Dei, Vol. i. p. 65. mentions a red marble, whereof the red is of different shades, to be dug in Carniola, which perhaps may be of this species.

XIV. *Marmor carnei coloris.*

This is of an agreeable pale flesh colour, but not quite uniform, as it shews shades of a pale whitish and yellowish casts, and also of a rosy hue, stronger in some parts than in others; it is a very beautiful marble, and is capable of a very fine polish; its texture is fine, compact, and uniform, and not quite destitute of brightness; it is heavy, and will not strike fire with steel.

I have likewise seen specimens of this marble, which were of a deeper colour, more inclinable to red, and quite uniform.

This is an Italian marble, and is commonly called *il Carnaggione* from its flesh like colour.

Scheuchzer, Oryctogr. Helvetica, p. 122. et seq. mentions flesh coloured marbles to be found in the Canton of Bern, and by Puschlaff in Pundren, which probably may be of this species.

XV. *Marmor purpurascens, f. Vinacei coloris.*

This marble is of a pale purplish colour, like claret lees, not uniform, but much disturbed by different shades of the same colour, and has also some few thin veins of red, and of a crystallized spar; it admits a very good po-

lish, is of a fine, strong, compact, solid texture, and not quite destitute of brightness where broken, is heavy, and will not strike fire with steel.

This marble was said to be dug in England.

OBSERVATIONS on the BROWN and RED MARBLES.

An ashen brown marble is dug in the Canton of Bern, in Switzerland (1); an elegant reddish brown sort is got at Seidelsbruch, near Hof, a town in the Margraviate of Bayreuth (2); and a fine clear brown marble, marked with lines of a darker shade, is found in the dynasty of Burgk in Voigtland (3).

Red marbles are dug in many places of Germany; in Switzerland (4), a fine marble of a saffron red colour, in the Canton of Bern; another of a fiery red colour, at Julierberg in Pundten, and in the Grisons country (5); an elegant glossy pale red marble, at Sidelsbruch, a mile from Hof, in Bayreuth (6); a dark red marble, spotted with a clearer red colour, at Badra, in the territory of Schwartzburg-Sondershufen (7); a dark red marble, at Pirna in Saxony (8); a dark or blood red marble like Porphyry, in Arnisdorff, by Schmideberg, in Silesia (9); and in France (10), a reddish marble near the city of Montbart, in Burgundy.

SECT. V. The Yellow Marbles.

XVI. *Marmor luteum.*

MARMOR *specie mellis aut terebinthinæ.* Cæsalp. de Metall. p. 95.

Marmo giallo. Imperat. Hist. Nat. l. xxv. c. 8.

Giallo Antico, Giallo di Verona, et Giallo di Sienna, Italice.

Marmor durissimum, lucidum, pallide flavum, et Marmor variegatum, elegantissimum, flavo purpureum. Hill's Hist. Foss. p. 464. N°. 1. and p. 478. N°. 1.

Marmor flavum de Siena, ex Italia. Bruckm. Epist. Itin. Cent. ii. Ep. 25. p. 234. N°. 7.

The most general colour of this marble is a beautiful yellow, quite plain and uniform, and free from variegations of any other colours; but the yellow

(1) Scheuchzer Oryctogr. Helvetica, p. 124. (6) Bruckm. Epist. Itin. l. c. p. 5. N°. 1. et Ephem. Nat. Curios. l. c.

(2) Bruckman Epist. Itin. Cent. I. Ep. 24. p. 7. N°. 51. et Ephem. Nat. 26. p. 251. N°. 94.

Curios. Vol. v. p. 106. Observ. 27. (8) Mylius's Saxonia Subterr. P. I. p. 79.

(3) Ephem. Nat. Curios. l. c. (9) Volkm. Silesia Subterr. p. 38.

(4) Scheuchzer Oryctogr. Helvetica, p. 123, 125. (10) Argenville Tentam. Enum. Foss.

(5) Bruckm. Magn. Dei, Vol. i. p. 45. Gallia, p. 97.

of

of it, in different blocks, is found to be sometimes much deeper, at other times much paler, and near to a straw colour, and sometimes it is also found variegated, in a very beautiful manner, with deep purple, blackish, and white veins and spots.

It is a most beautiful and valuable marble, and capable of an elegant polish; its texture is extremely fine, compact, close and solid, glossy and smooth, but not bright or glittering when broken; it is considerably heavy and hard, will not strike fire with steel, and burns to a pale flesh colour.

The principal quarries of this marble are near Sienna in Tuscany, where it is dug in great quantities; there are also several quarries of it near Verona.

It is likewise found at Mafra, about twelve leagues from Lisbon, and in some parts of Spain; that found at Mafra, is generally greatly variegated with other colours.

Smith's Nat. and Civil Hist. of the County of Cork, Vol. ii. p. 376. says, it is also dug near Mitchel's Town in that county. In Monmouthshire, and some of the neighbouring counties in Wales, it is likewise found. The specimen exhibited by Woodward, Cat. A. x. b. 2. is of this kind; but the Welsh marble is always greatly variegated with white and purple, and the yellow colour is somewhat brownish and not so beautiful.

The marble of a yellowish ground, or golden colour, with purple veins, mentioned by Argenville, Tentam. Enum. Foss. Galliae, p. 98. to be found at a place called Cargoloin, near the city of Nuits, in Burgundy, is very probably of this species; as is perhaps also the *Marmor lutei coloris, imagines reddens, ut fere olim Phengites*, exhibited by the Mus. Richter. p. 199. from Saltzburg in Germany.

This marble is greatly esteemed, and is extremely dear in England.

OBSERVATIONS on the YELLOW MARBLES.

The yellow marble of Siena and Verona, seems not to have been known to the antients, who had their yellow marble chiefly from Numidia; but by the fragments of their yellow marbles, which have been found in Herculaneum, and other antient ruins, they prove to be of the very same kind as that found at Sienna.

Statius (1) informs us, that the yellow marbles were more esteemed by the Romans than any other kinds.

Marbles of this colour are dug in Switzerland (2), at Megenwyl; in great quantity near the city of Baden; and a whitish yellow semi-transparent marble in the Canton of Bern. In Germany a very elegant kind is dug, at

(1) Non huc admiffæ Thafos, aut Sola nitent flavis Nomadum deciffa undosa Caryftos : metallis.

Moeret Onyx longe, quæriturque (2) Scheuchzer's Oryctogr. Helvetica, exclusus Ophites. p. 122 et 126.

Mount

Mount Streitberg, on the Fichtelberg, in Franconia (3); and another sort with shades or spots of a darker colour, in the duchy of Blankenberg (4); and in France (5), in the mountains near the city of St. Pons in Languedoc.

SECT. VI. The Blue Marbles.

XVII. *Marmor subcæruleum.*

PIERRE bleue, *Blaeuwe stein*. Boccone Recherches et Observ. Nat. Lett. 13. p. 124.

Marmor subcæruleum, splendidum, durius, quod Marmor Numidicum antiquorum. Hill's Hist. Foss. p. 465. N°. 1.

This marble is of an agreeable uniform blueish colour, very heavy and hard; it admits a very good polish, and an extremely glossy smooth surface; its texture is very firm, compact, and solid, and is considerably bright and glittering; it will not give fire with steel, and calcines to a white colour.

The above is the most general appearance of this kind of marble, but it is also not unfrequently found variegated with streaks and large veins of a snow white opaque spar, and set with *Madrepore Coralloids*, and sometimes, tho' very seldom, with small *Entrochi* and other marine remains.

The *Madrepore Coralloids*, which are found lodged in different positions, so that the sides of some, and the ends of others appear, are cylindrick tubes, generally about the thickness of a goose quill, sometimes as small as a wheaten straw; they are made of plates placed lengthways of the cylinders, from the axis to the circumference, so as to compose a stellar pore, running through the whole length of the body, and have also furrows parallel to their length on their surfaces; they are composed of a snow white opaque spar, which has filled up the vacuities of the *Coralloids* themselves, now corroded and washed away; these coralline bodies being white, and the stone of a dark colour, appear together very beautiful.

This marble is used in very great quantities in the cities of Holland, chiefly for steps to the houses; it is brought there from the county of Namur, the Pais des Vallons, and the other adjacent parts of Flanders, where are vast quarries of it. The inhabitants of that country as well as those of Holland, call it *blaeuwe stein*, i. e. the blue stone.

Hill affirms this marble to be the *Marmor Numidicum* of the antients. The Mus. Richt. p. 186. says that it was a yellow marble. Worm. Mus. p. 42. makes it to have been a black marble, and others affirm it to have been a red marble; but as the antients have left us no description of their said *Marmor Numidicum*, the opinions of these different authors seem to be founded only on conjectures.

(3) Bruckm. Epist. Itin. Cent. i. Ep. 24. p. 3. N°. 1. (5) Argenville Tentam Enum. Foss. Gallia, p. 66.

(4) Bruckm. Supplem. ad Cent. ii. Epist. Itin. p. 1264. N°. 42.

OBSERVATIONS on the BLUE MARBLES.

Marbles of this colour are extremely rare. Argenville (6), however, mentions a marble of a fine deep blue colour, to be found in the mountains near the city of St. Pons in Languedoc, in France.

S E C T. VII. *The Green Marbles.*

XVIII. *Marmor diverso viridi colore variegatum, quod Marmor Lacedæmonium antiquorum.*

MARMOR *Lacedæmonium* f. *Viride*. Pliny's Nat. Hist. I. xxxvi. c. 7. Kentm. Nom. Foss. p. 54. N^o. 1, 2 and 3. Cæsalp. de Metall. p. 93. Aldrov. Mus. Met. p. 752. Worm. Mus. p. 43. Mus. Richter. p. 187.

Marmor durius, virescens; quod Marmor Lacedæmonium antiquorum. Hill's Hist. Foss. p. 468. N^o. 1.

This is a very elegant and beautiful marble, of a fine bright green colour, not uniform or regularly diffused, but leaves spots and lines of brighter, darker, and paler green than the general colour; the brighter spots appear near lucid, the darker ones approach even to black, and others to whiteness; it admits a very fine polish and smooth surface, is very hard and heavy, and of a close, compact, solid texture; it will not strike fire with steel, and burns to a pure white.

The ground colour is also sometimes of a fine deep grass green, and is only diversified with near lucid spots, of a fine light green, and variegated with some small spots and veins of a milk white opake spar: This variety is dug in Italy, and is known by the name of the *Verde Piumino moderno*.

The antients, who greatly valued this marble, fetched it from Egypt; at present it is found in several parts of Europe; in Italy it is dug near Verona, Leopold Itin. Suecico, p. 101. mentions it to be found at Geddeholm; and Bruckm. Epist. Itin. Cent. ii. Ep. 26. p. 249. N^o. 64. at Kuhl-Muhlen, in Ost Gothland in Sweden: And Hill informs us, that there is a stratum of it about Bristol, four or five miles from the Hot Well, and several considerably thick strata of it in Wales.

Many have erroneously imagined this marble to be the *Ophites* of the antients, and to which they attributed great virtues, as a remedy against poisons; the same virtues have in like manner been attributed to this; for De Laet de Gemm. et Lapid. l. ii. c. 26. informs us, that he received a peice of this marble, by the name of *Ophites*, from the learned Car. Clusius, given to the said Clusius, when in England in 1581. as a fragment of a drinking cup of Edward IV. King of England, which was greatly valued as an antidote against all poisons.

(6) Tentam. Enum. Foss. Galliaë, p. 66.

XIX. *Marmor*

XIX. *Marmor viride varium alterum.*

Breccia verde. Imperat. Hist. Nat. l. xxv. c. 8.

This is not a beautiful tho' a very curious marble; the ground is of a disagreeable lightish green colour, and is thick set with spots, chiefly small and irregular, of a deep blackish green colour; the ground of it admits but a midling polish, the blackish green spots work more glossy and fine; it is moderately heavy and hard; the basis or ground of the marble is quite sparry, of a solid, uniform, and compact texture, and ferments violently with aqua fortis; but the blackish green spots are terrene, of a coarse texture, appear somewhat porous, and are not in the least acted upon by acids; the structure of this marble is not homogeneous, or forming one solid mass, but is of that sort, to which the Italians have given the name of *Breccia*, that is, that there are parts or pieces of a different nature in it, which are not blended with the substance of the stone, but are as if inlaid or stuck in it.

Imperatus informs us, that this marble is also sometimes found with reddish spots.

It is dug in Italy, and is used in ornamental works!

XX. *Marmor pallide virescens.*

This marble is of a very pale greenish colour, diversified with straight veins of different shades of the same colour; it admits a smooth surface, tho' but an indifferent polish; it is heavy, and moderately hard, of a coarse granulated texture, and the veins glitter exceedingly, with very minute spangles, of a substance like a bright silvery talc, and appear somewhat flakey and striated; it is too soft to strike fire with steel.

I was informed that this marble is dug in Sweden.

OBSERVATIONS on the GREEN MARBLES.

A marble of this colour is found in Switzerland (7), and a soft kind, which, however is capable of a very good polish, is got at Hartzgerod (8), in the principality of Bernburg, in Germany.

(7) Bruckm. Magn. Dei, &c. Vol. i. (8) Bruckm. Epist. Itin. Cent. i. Ep. p. 40. 26. N^o. 4. p. 3.

DIVISION II.

*Marbles of two colours.*SECT. I. *Black Marbles variegated with other colours.*XXI. *Marmor nigerrimum venis maculisque albis variegatum.*

THIS is of a jet black colour, with veins and spots of fine white opaque spar; it is moderately heavy and hard, and is capable of a very elegant polish; its texture is compact, and solid, and not quite destitute of brightness; it will not strike fire with steel, and burns to a grey colour.

Marble of this kind is dug at Broad Helmstone, four miles S. E. of Ashburton in Devonshire, where it is greatly used for tombs, chimneys, &c. it is also dug at Torbay in the same county: in Italy there are many quarries of it, and from that country great quantities are yearly brought to England.

It is also dug in most parts of Europe.

XXII. *Marmor nigrum venulis albis variegatum.*

The ground of this marble is of a fine black colour, and is slightly streaked and spotted with a pale white. It admits a fine polish, excepting the white streaks, which are often rude and very rough, and form breakings or flaws on the surface; the substance of the marble or black part, is of a firm, compact, uniform texture, and not quite destitute of brightness; the white streaks are composed of a coarse cretaceous substance, with some little admixture of spar; it is moderately heavy and hard, and does not give fire with steel.

I received this marble from Italy, by the name of *Bianco e Nero Orientale, Antico*.

XXIII. *Marmor nigrum venis albidis rectis pulchre variegatum.*

This is a very pretty marble; its ground is of a fine black colour, and is thick set with veins of different breadths of a pale whitish spar, which in some parts is semi-pellucid; the veins are not irregular, but run quite streight and parallel to each other, in a very elegant manner; it admits a very fine polish, and smooth surface, is heavy, moderately hard, of a firm, compact, solid texture, and not quite destitute of brightness, and does not give fire with steel.

It is dug, with several other kinds of marble, at Rubeland, a village a mile distant from Blanckenburg, the capital of the duchy of that name in Germany.

XXIV. *Marmor nigrum albo variegatum, Africanum dictum.*

Marmo detto Africano. Imperat. Hist. Nat. l. xxv. c. 8.

Marmor Africanum s. Proconnesium, v. Leucomelanon. Mus. Richt. p. 188.

Marmor Africanum maculatum album. Linnæus's Syst. Nat. p. 152. N^o. 8.

The ground of this marble is black, diversified with moderately large white spots, which do not communicate with each other, but are surrounded on all sides by the black colour, and appear like islands or shields; they are sometimes also tinged a little reddish, and the marble has some marcasitical grains intermixed with it; the white parts of this marble are sparry, of a moderate hardness, and calcine easily, but the black parts are generally very hard, and rather vitrify in the fire, and endure the injuries of the weather to admiration, while the white easily wear away, and leave the black every where prominent; it admits a good polish and will not strike fire with steel.

XXV. *Marmor nigrum albo pulchre variegatum, Bianco e Nero vulgo dictum.*

Bianco e Nero. Imperat. Hist. Nat. l. xxv. c. 8.

Marmor rarius ex Niveo et Atro pulchrè variegatum, Nero e Bianco Antico. Scheuchzer's Oryctogr. Helvetica, p. 123.

Marmor Leucomelanon, hodiernum Bianco e Nero Moderno. Mus. Richter. p. 193.

Brocatello, Marmor nigrum et candidum perpulchrum ex Italia. Bruckm. Epist. Itin. Cent. ii. Ep. 25. p. 234. N^o. 4.

This is a very elegant marble, it is variegated with an irony-black and milk white colours, greatly intermixed together in numerous small spots, generally oblong, of which the black are the largest, and make up the chief part of the marble; it is capable of a very fine polish, and of an even surface; the white parts are composed of a milk white opaque spar, and appear somewhat *brecciated*, i. e. inlaid or stuck in the mass, for they do not intimately blend with the black parts; the black spots are coarse and stoney, solid and uniform; it is moderately heavy and hard, and will not strike fire with steel.

This marble is dug in Italy, and Scheuchzer, *l. c.* informs us, it is also found in the Canton of Bern, in Switzerland.

XXVI. *Marmor griseo-nigrum albo variegatum.*

The colours of this marble, which are an irony black and a greyish white, are near in equal proportion; the variegations are generally in long streaks, and somewhat resembling flames; it admits a very fine polish, and a perfect even surface, and is a very fine marble; it is of a very bright, glittering, granulated texture, the granules are moderately large, and cohere firmly together; it is very heavy and moderately hard, and will not strike fire with steel.

The

The quarries of this marble are in the territories of the republick of Genoa, and a very great quarry of a coarse soft kind of this marble, with very large glittering granules, has also been lately discovered at Priborn, in the duchy of Brieg in Silesia, and is now worked by the command of the king of Prussia, who has many chimney peices, and other ornamental works in his Palace made of it.

XXVII. *Marmor nigrum flavo variegatum.*

Marmor nigrum, venis luteis. Giallo e Nero Antico. Marmor Thebaicum antiquorum. Mus. Richter. p. 188 and 192.

Marmor variegatum nigro luteum. Hill's Hist. Foss. p. 480. N°. 3.

This marble is of a fine black colour, variegated with irregular veins and spots of a deep yellow, and generally some small thin veins of white spar; it is capable of a fine polish, and of a very smooth surface; its texture is fine, compact, and solid, but not at all bright or glittering; it is very heavy, of a considerable hardness, and will not strike fire with steel.

This marble is dug in Italy, from whence we fetch it in great quantities, and is in common use with us.

Bruckm. Magn. Dei in loc. Subterr. Vol. i. p. 65. mentions a black marble with veins of a deep yellow, to be found in Carniola; and Scheuchzer, Oryct. Helvetica, p. 121. mentions another with fine yellow veins and lines, to be dug near the village Albisrieden, in the Canton of Bern, in Switzerland, which marbles are probably of this species.

This marble seems to be the *Marmor Thebaicum* of the antients, which they fetched from Egypt. Pliny l. xxxvi. c. 8. immediately after describing the *Alabandicum*, as a fine black marble, tells us, that the *Thebaicum* was variegated with gold coloured spots, which quadrates much with the colours of this marble, whose yellow might be called a gold colour on a black ground.

OBSERVATIONS on the BLACK variegated MARBLES.

Besides the species of black variegated marbles here described, the following sorts are slightly mentioned by authors.

The black marbles variegated in various manners, with veins, streaks, clouds, spots, &c. of white are very numerous, and are dug in plenty in most parts of Europe, it is therefore needless to enumerate the kinds exhibited by authors, or mention the places where there are quarries of them.

A black marble with numerous veins of grey, placed so as somewhat to resemble the lines on a map, is dug on the banks of the Oker, near Gollar, Bruckm. Supplem. ad Cent. ii. p. 1265. N°. 44.

A very elegant fine hard marble, spotted with black and grey, in near equal proportions, and generally with grains of gold coloured marchasite in it, is dug from a quarry at Lemmerberg, in the metallic district of Neylau, and is reckoned the finest marble in those parts, Bruckm. Epist. Itin. Cent. i. Ep. 24. p. 7. N°. 46.

A black marble with grey spots is dug at the city Rudelstadt, in the county of Schwartzburg, Bruckm. Ibid. Ep. 25. p. 13.

A greyish black marble with red spots, and generally with grains of mar-chasite in it, which hinders its taking a good polish, is dug on Mount Fichtelberg in Franconia, Bruckm. Supplem. ad Cent. ii. p. 1261. N^o. 5. A black marble with red spots is also mentioned by Mylius, Saxonia Subterr. P. i. p. 79. to be dug in Saxony.

A fine black marble with light green spots, is dug on the Pfarr Widmuth at Glogau in Silesia; the regular canons of St. Austin at Breslau have many tables, and other ornamental works of it in their abbey. Volkmann's Silesia Subterr. c. 2. p. 37.

SECT. II. *White Marbles variegated with other colours.*

XXVIII. *Marmor album venis maculisque nigris variegatum.*

THIS white marble is variegated with veins, clouds, and spots of different shades, from a greyish black, to a fine black colour, but not often with the latter; the variegations are very irregular, and run in all directions; it is capable of a very fine polish, and of a very smooth surface, is heavy, moderately hard, and of a granulated texture, the granules very bright and glittering, and generally moderately large, flat, and not very firmly cohering together; it will not strike fire with steel, and calcines with little difference of colour.

There are many quarries of this marble in Italy, and we import from thence great quantities for ornamental works, &c.

It is also dug in many parts of Europe. Mylius, Saxonia Subterr. P. i. p. 78. informs us, that there are vast strata of it at Waldheim, and at Kalchgrun in Saxony, the strata strike forth at Weisenthal, beyond Crottendorff, towards Grunhayn, in a streight line, and that many thousand centners of this Saxon marble were sent down the Elbe to Amsterdam, to build the magnificent structure, called the Stadthuis or Town-house in that city.

XXIX. *Marmor album lineolis s. striis nigris pulchre notatum.*

Marmo scritto s. Marmor scriptum. Imperat. Hist. Nat. l. xxiv. c. 25. Gimma, p. 26. § 66.

Marmor scriptum et versibus velut exaratum Imperati. Mus. Richter. p. 194.

Lapis litteratus albus litteris nigris Sinicis inscriptus, Orientalis. Kundm. Cat. Rer. Nat. et Artific. p. 217. c. 163.

This is a very elegant and beautiful marble, the ground is white and thickly streaked with black, the black streaks run in such a manner, as to form curious and pretty resemblances of oriental letters, from whence it has obtained the name of the *written marble*; it is capable of a very fine polish, and does not strike fire with steel.

Scheuchzer, Oryctogr. Helvetica, p. 123. exhibits a *Marmor micis veluti talcosis splendens, candidum nigricantibus lituris signatum*, to be found in the Canton of Bern, in Switzerland; which marble is probably of this species.

The whitish marble with black dendritæ, mentioned by Bruckm. Supplem. ad Cent. ii. p. 1263. N°. 23. to be found at Crottendorf in Misnia, may be referred to this species, as may probably also the whitish marble with black streaks, mentioned by the same author, Epist. Itin. Cent. i. Ep. 26. p. 4. to be found at the village Rubeland, a mile from Blankenburg; the capital of the duchy of the same name.

XXX. *Marmor album venis purpureis vel rubris variegatum:*

The ground of this marble is milk white, thickly variegated with streaks or thin veins, and some few spots, generally of a fine purplish red, but sometimes of a deep or blackish purple colour; the streaks or veins run very irregularly, and join together, and often inclose spaces of the ground colour, like islands, which are generally small and very irregular; it is heavy, and moderately hard, of a firm, bright, compact, solid texture, but the red veins are of a hardened ochreous substance, and are sometimes very glossy and flakey; it will not strike fire with steel, is capable of a very fine polish, and a smooth surface, and is a very beautiful marble.

It is dug in Italy, and coarser kinds of this marble are also found in some other parts of Europe, which are not to compare to the Italian.

Volk. Silesia Subterr. p. 37. mentions a white marble with blood coloured veins, to be dug at Meywalde, a mile from Hirschberg in Silesia; which probably is of this kind.

XXXI. *Marmor album rubro variegatum:*

This is a very pretty and fine white marble, thickly and irregularly variegated with a reddish brown, but sometimes also the brown is the ground colour for large spaces; the variegations of red and white are vastly confused and intermixed in blotches or spots, but never run in veins; sometimes small grains and threads or slight veins of a goldish marchasite, and spaces of a dusky coarse terrestrial substance, are found in this marble; it is capable of a very good polish, but the surface generally has small breaks or flaws on it; it is heavy, moderately hard, of a firm solid texture, and of a glossy, flakey, sparry substance, but the red parts are chiefly of a solid, compact, hardened, ochreous matter, and it will not strike fire with steel.

I was informed it was dug in great quantities in Scotland.

XXXII. *Marmor albescens semipellucidum, rubro variegatum.*

This marble is of a sullied whitish colour, variegated with red, which runs in irregular streaks through the marble, and flaws or spaces of a dusky terrestrial matter, and spots and small veins of a greenish black opaque substance also pervade it, and its surface is most generally much covered with a film of the like matter, which admits no polish; the parts of the marble, which are not covered with this film, are capable of a pretty good polish, and of an even surface, and it is a pretty marble. Its texture is firm, compact, and solid, and it is composed of a glossy semipellucid spar; the red streaks in this marble are not of a distinct ochreous or other substance, but are only the same spar tinged red by mineral exhalations; it is heavy, generally shattery or soft, and will not strike fire with steel.

I received this marble, with an account that it was dug in the parish of Sibbo, in the Province of Nylandia, in Finland.

XXXIII. *Marmor album rubro variegatum alterum.*

Marble veined with white and red, and marble, the ground white veined and spotted with red, from near Plymouth. Woodw. Cat. A. x. b. 4. et Cat. E. b. 19.

Marmor variegatum, durius albo rubescens. Hill's Hist. Foss. p. 475. N° 3.

This marble is of a sullied white ground, thickly veined and clouded with deep red, and sometimes also variegated with small veins of a livid colour, a brown, &c. it is of a very fine, close, compact, solid texture, and is not quite destitute of brightness; the red parts are quite opaque, and coarser than the white, and are generally extremely hard, the white parts are composed of a fine bright opaque spar, which sometimes is also near crystalline; it is remarkably heavy, is capable of a very elegant polish, and is a very beautiful marble; it will not strike fire with steel, and calcines to a pale reddish white.

The quarries of this marble are near Plymouth in Devonshire, and much of it is brought to London for use.

XXXIV. *Marmor album rubro variegatum tertium.*

This is a very fine and beautiful marble; the ground is whitish, variegated with streaks or streamers of a fine pale red, or rather blushes of red; it is capable of a very elegant polish, and of a very smooth surface; its texture is extremely fine, compact, and solid, and not quite destitute of brightness, and is very remarkable, in that it generally appears of a somewhat laminated structure, or composed of very thick plates, laid regular and even on each other; it is heavy, moderately hard, and will not strike fire with steel.

There are vast strata of this marble in the estate of Arthur Herbert, Esquire, near Killarny, in the county of Kerry in Ireland.

XXXV. *Marmor album venis viridibus variegatum.*

This is a white marble with a greenish cast in many places, and variegated with slender straight veins of green, and some veins of an opaque terrestrial substance; it is capable of a very good polish, and of an even surface; its texture is extremely fine, bright and sparkling, opaque, and composed of exceeding minute granules, so firmly cohering together as to appear almost solid, yet it is a soft marble, and very easily broken; it is moderately heavy, and will not strike fire with steel.

I received this marble, with an account that it is dug at Sahlberg, in the Province of Westmannia in Sweden.

XXXVI. *Marmor albescens venis viridibus variegatum.*

This marble is whitish, but with a very strong tinge of green, and is variegated with pretty broad straight veins of a deep green colour; it is capable of a good polish, and moderately even surface, and is a very agreeable marble; its texture is compact and solid, and is composed of a fine bright sparkling, and near pellucid spar, and the marble when cut in thin pieces, is likewise semipellucid; the green veins are quite opaque, and are mixed with great quantities of a bright glossy foliaceous substance; it is heavy, moderately hard, and will not strike fire with steel.

It is an Italian marble.

OBSERVATIONS on the WHITE variegated MARBLES.

Besides the species of white variegated marbles here described, the following sorts are slightly mentioned by authors.

A white marble speckled with small black specks, and another spotted with black, are found in the Canton of Bern, in Switzerland; Scheuchzer's *Oryctogr. Helvetica*, p. 122.

A white marble with grey spots, vulgarly called *Tbranen Stein*, i. e. *the Weeping or Tear Stone*, is dug in Moldavia. Bruckm. *Epist. Itin. Cent. i. Ep. 25. p. 12.*

Marble spotted with white, and a dusky grey near black. This marble is very fine, but mighty full of flaws, dug at Torbay in Devonshire, Woodw. *Cat. E. b. 21.*

White marble with yellow veins from Hall in Saxony, Bruckm. *Supplem. ad Cent. 2. p. 1263. N^o. 21.*

White lucid marble with bright green spots, and white marble with few green spots, found in the Province of Ostrogothia in Sweden, the latter sort at Kuhl Muhlen in that Province. Bruckm. *Ib. Cent. ii. Ep. 25. p. 238. N^o. 41. et Ep. 26. p. 249. N^o. 63.*

S E C T. III. *Asb and Grey Marbles variegated with other colours:*XXXVII. *Marmor griseum nigro variegatum.*

THIS is a pretty marble of a pale iron grey colour, thickly and irregularly variegated with streaks, and some few spots of black; it is capable of a fine polish, and of a very smooth surface, is moderately heavy and hard, of a fine, compact, solid texture, extremely bright and glittering, will not strike fire with steel, and calcines to a pure white colour.

The quarries of this marble are at Rubeland, a village a mile from Blankenburg, the capital of the duchy of the same name in Germany.

Scheuchzer, Oryctogr. Helvetica, p. 123. mentions a grey marble variegated with black streaks and spots, to be found in the Canton of Bern; another grey marble, with blueish black veins, and often full of petrefactions, is dug in great quantities in the island Kumersoen, near Holmestrand, in the Province of Aggershuus in Norway. Bruckm. Epist. Itin. Supplem. ad Cent. ii. p. 1266. N°. 54. exhibits a grey marble with black veins, and pyritical grains from Strasburg in Alsatia; and the said author, Ib. Cent. i. Ep. 24. p. 6. N°. 34. and Magn. Dei, in loc. Subterr. P. II. p. 145. informs us, that there are quarries of a grey marble, finely streaked and veined with black, near the city Hof, in the margraviate of Bayreuth; all which marbles are probably of this kind.

XXXVIII. *Marmor livido-gryseum nigro maculatum.*

This is a very elegant and fine marble, it is of a livid greyish ground, or of the colour of a boiled liver, but paler, variegated with large spots or clouds of a fine deep black, sometimes some small specks of a rust colour, and peices of brassy marcasite are found in it; it is capable of an elegant polish, and smooth surface, almost equal to an agat; it is moderately heavy and hard, and is of a fine, compact, solid texture.

I received this marble from the Margraviate of Bayreuth, or Culmbach in Franconia.

XXXIX. *Marmor cinereum maculis parvis nigris pulchre inspersum.*

An Marmor cinereum Italicum, cum nigris maculis quæ serpentibus similes sunt, et Marmor cinereum Rochlicium cum nigris maculis, quæ sunt cornicum ungulis similes, Kentm. Nom. Foss. p. 54. N°. 5 et 6?

Marmor Cinereum Bobemicum, punctulis nigris inspersum. Boh. Balbinus Hist. Bohemiæ, Lib. I. c. 33. p. 22 et 82. Encelius de re Metall. l. iii. c. 40. Kundm. Prompt. p. 202. N°. 59.

Marmor cinereum, maculis parvis nigris variegatum, quod Tephria et Ophites cinereus antiquorum. Hill's Hist. Foss. p. 486. N°. 1.

This

This is a very elegant and fine marble, of a lively ashen grey ground, thickly spotted with small irregular black spots, all nearly of the same size; it is capable of a very fine polish, and of a smooth surface, is considerably heavy and hard, of a compact solid texture, but quite destitute of brightness, and will not strike fire with steel.

It is a very rare marble, and but seldom found. At Joachimsthal, and some other parts of Bohemia, and in some few parts of Germany, there are quarries of it.

Hill asserts, that Egypt affords this marble to this day, and that it is frequently found in strata, and sometimes in loose masses; that in Germany they have much of it, but it is inferior to the oriental in purity and hardness, the ground is also often very foul and irregular, and the spots sometimes very large; but upon what foundation the said author grounds his assertion, is to me unknown, since it is certain, that neither experience nor late discoveries in the least prove it.

The antients had three kinds of *Ophites* marbles, viz. the black, the white, and the *Tephrias* or ash coloured kind, with black spots. Most authors, and with some probability, have imagined this marble to be the *Tephrias* or latter kind, but I am rather of the opinion of Imperatus, Hist. Nat. l. xxv. c. 8. who describes it as a stone of another genus, a kind of porphyry, of which same genus the black *Ophites*, now usually called the *Ophites antiquorum*, hereafter to be described, is; the said author says, the *Tephrias* in hardness is like the *Ophites niger*; that it is so exceeding hard as to strike fire freely with steel, neither has any acids any effect on it; that it takes an elegant polish, and is found in small masses; and for its beauty is worked like gems for ornaments.

The antients, tho' their arrangement of natural bodies was not always according to the nature and effects of them, yet seem to have had some such view in their arrangement of the species of *Ophiteæ*, for tho' they called them marbles, an appellation now to be justly rejected, yet they probably called only those kinds *Ophiteæ*, which did not calcine, were curiously spotted like the skins of serpents and which they imagined were of great efficacy against the bites of venomous animals; we have indeed no convincing proofs of this conjecture, as we are not quite positive, whether the stones we now think to be the *Ophiteæ* of the antients were so or not; but if probabilities may be allowed to take place, it seems reasonable to conclude so, as the *Ophites niger*, which we now call *Ophites antiquorum*, is a kind of porphyry, strikes fire with steel, and ferments not with acids; the Zoebnitz marble, vulgarly so called, which, likely, is the *Ophites candidus*, does not ferment with acids, tho' it is too soft to strike fire with steel, and the other *Ophites cinereus* or *Tephrias*, might reasonably be supposed to have the same properties as the first kind or *Ophites niger*; and I have seen even some fragments of stone, which entirely answer to such an *Ophites*.

XL. *Marmor griseum maculis parvis albis inspersum.*

Marmor griseum maculis parvis variegatum. Smith's Nat. and Civil Hist. of the county of Cork, Vol. ii. p. 377.

This has an ash coloured grey ground, variegated with darker coloured spots with white specks on them, and looks somewhat like shagreen; it takes a most resplendent polish, and is very beautiful in chimneys, tables, and other ornamental works: It may be raised in large blocks, in Mr. Welstead's estate, four miles west of Mallow, in the county of Cork, in Ireland.

Dr. Woodward, Cat. A. * b. 10. exhibits a fragment of marble of a dark ash coloured ground, spotted very thick with white, found in the river Palmer in Cornwall, which probably is of this kind; as also the ashen grey marble with white spots, said by Milius, Saxonia Subterr. P. I. p. 77. to be found in Saxony.

XLI. *Marmor cinereum venis et maculis albis variegatum.*

Smith's Nat. and Civil Hist. of the county of Cork, Vol. ii. p. 377.

This marble is of an ash coloured or grey ground, variegated with spots and veins of white; it takes a good polish and a smooth surface, is heavy, of a compact texture, and burns to a yellowish white colour.

The quarry of this marble is in the lands of Castlemary, the estate of Robert Longfield, Esquire, in the county of Cork; it is much used for ornamental works in Ireland.

The fragments of marble exhibited by Woodward, Cat. A. * b. 12, 15, and 17. from Loo Beach in Cornwall, and from the shore near Overthorn, in Yorkshire, seem to be fragments of this kind of marble.

Grey marble with white veins, Scheuchzer, Oryctogr. Helvetica, p. 124, and 126. informs us, is dug in der Auw, a league from Einsidlen in the Canton of Switz, and on the Schollberg, half a league from the little city Sargans, in the Prefecture of Sargans, in Switzerland. A dark grey marble with broad white veins, is also dug at Hartzgerode, in the Principality of Anhalt in upper Saxony, according to Bruckm. Epist. Itin. Cent. i. Ep. 26. p. 3. No. 3. and a light grey marble clouded with white, Wolkman Silesia Subterr. p. 37. informs us, is got at Meywalde, a mile from Hirschberg in Silesia.

XLII. *Marmor cinereum maculis fuscis variegatum.*

This marble is of a livid ashen grey ground, with small streaks of a darker shade, and very thickly spotted with a deep dull brown colour, the spots all join and mix confusedly together, and are vastly irregular; it is capable of a very elegant polish and even surface, almost equal to an agate, and is a pretty marble; its texture is very fine, firm, compact, and solid, and not quite destitute

stitute of brightness; it is hard, moderately heavy, will not strike fire with steel, and calcines to a pale brown or clay colour.

I was informed, that this marble is dug in Franconia. I have also seen some other German marbles, which I take to be of this very species, somewhat differently coloured, viz. the ground of a much darker colour, near blackish, and with some slight tinges of red, intermixed with the brown spots.

Scheuchzer, Oryctogr. Helvetica, p. 123. exhibits a grey coloured marble, with chesnut brown spots, found in the Canton of Bern, in Switzerland; and Bruckm. Epist. Itin. Supplem. ad Cent. ii. p. 1262. N°. 8. mentions a light grey marble, variegated with many brown veins, to be dug on the Fichtelberg in Franconia, both which marbles are probably of this species.

XLIII. *Marmor nigro-griseum maculis pallide rubris.*

Marmor Africanum corallinum, ut vulgo indicatur, cinereum maculis miniatis. Mus. Richt p. 191.

This is a very pretty marble, tho' its colours are not bright or strong; its ground is of a blackish grey colour, variegated with many irregular streaks and veins of black, and spots of a fine pale purplish red, generally larger than a sixpence, and not quite uniform in colour, but are a little blended with pale white; it is capable of a very fine polish, and of a smooth surface; its texture is very compact and solid, fine and very glittering or bright; it is moderately heavy and hard, and will not strike fire with steel.

It is an Italian marble.

XLIV. *Marmor cinereum, maculis et venis virentibus variegatum.*

Hill's Hist. Foss. p. 487. N°. 3.

This marble is generally of a fine pale grey ground, (but sometimes it has a cast of red, and sometimes is whitish) variegated with spots and veins of a fine pale green; it is capable of an elegant polish, and of a smooth surface, and is a beautiful marble; its texture is very compact and solid, and quite destitute of any glittering or brightness; it is very hard and heavy, will not strike fire with steel, and calcines to a pale whitish grey colour.

It is dug in some parts of Germany; there are quarries of this marble, which is mostly veined, and but seldom spotted, on der Geigen, near the city Hof, in the Margraviate of Bayreuth, according to J. G. Buchner in Ephem. Nat. Curios. Vol. v. p. 106. Observ. 27. & Bruckm. Epist. Itin. Cent. i. Ep. 24. p. 6. N°. 39. and the latter author, Ib. Cent. ii. Ep. 26. p. 249. N°. 59. also exhibits a whitish grey marble with green spots, to be found at Kuhl Muhlen, in the Province of Ostrogothia in Sweden; which very probably is of this same species.

OBSERVATIONS on the ASH and GREY variegated MARBLES.

Besides the species of ash and grey variegated marbles, here described, the following sorts are slightly mentioned by authors.

A variegated grey and white marble, dug at Saltzburg in Germany, Mus. Richter. p. 199.

An ash coloured and red marble, of which the variegations exactly resemble characters or writings, Mus. Richter. p. 199.

An ash coloured marble variegated with red and purple veins from Affenburg, in the duchy of Brunswick; a like marble is also dug in Carniola; Kundm. Cat. Rer. Nat. et Bruckm. Magn. Dei, in loc. Subterr. P. I. p. 65. et Artific. p. 189. b. 92. & 132.

A whitish grey marble with dark red spots, found at Kuhl Muhlen in Ostrogothia in Sweden, Bruckm. Epist. Itin. Cent. ii. Ep. 26. p. 249. N°. 62.

A variegated grey and red marble, got at the village Badra, in the territory of Sonderhusen, Bruckm. Ib. p. 251. N°. 90.

A quarry of marble striped with grey and red lines, very elegant, and which looks like a French tabby, has been lately discovered on Schertlasz, by Selbitz, on the Fichtelberg in Franconia, Bruckm. Ib. Cent. i. Ep. 25. p. 3. N°. 67.

Marbles grey with some red, called *Linghon*, are dug in the territory of Marquise, near Ambleteuse in Picardy. Argenville, Tentam. Enum. Foss. Galliae, p. 11.

A variegated grey and yellow marble, dug by S. Tryphon, in the Bailiwick of l'Aigle, in the Canton of Bern; Scheuchzer, Oryctogr. Helvetica, p. 124. and on Mount Pickelberg, near Ludewigsburg, in the territory of Coburg, Bruckm. Epist. Itin. Cent. i. Ep. 25. p. 10. N°. 2.

A grey marble, with yellow spots and veins, found at Rochlitz, Kentm. Nom. Foss. p. 53. N°. 4. et Mus. Richter. p. 198. and an elegant and fine dark grey marble, with citron yellow spots, is mentioned by Mylius, Saxonia Subterr. P. I. p. 77. and by the Ephem. Nat. Curios. Vol. v. p. 106. Observ. 27. to be dug near the City of Plaven in Voigtland.

A grey marble, with sand coloured veins, is dug in the valley of Suson at a village of the same name, near the city of Dijon in Burgundy, Argenville, Tentam. Enum. Foss. Galliae, p. 98.

SECT. IV. *Brown and Red Marbles variegated with other colours.*

XLV. *Marmor fuscum venis undulatis albis variegatum.*

MARMOR *Italicum, mixtum venis in corallino albis. Coranella Moderna.* Mus. Richter. p. 193.

Marmor fuscum durissimum, albido variegatum. Hill's Hist. Foss. p. 477. N°. 3.

This

This is a very beautiful marble, its ground is of a yellowish brown colour, and is variegated with veins of white, the veins all run one way, in fine wavy broad lines, elegantly representing the windings of rivers. The white and brown colours are not uniform, but generally of many mixtures in various proportions, which form very different shades of colours in the marble; it is capable of a very elegant polish, and smooth surface, is very hard, and remarkably heavy, of a fine compact solid texture, and will not strike fire with steel.

It is an Italian marble, but is not common, and is very rarely used, on account of it's hardness.

Bruckm. Epist. Itin. Cent. 2. Ep. 25. p. 235. N^o. 21. and p. 236. N^o. 25, exhibits a hard agat-like brown marble, with white veins, from Italy, which he calls *Leonino Orientale*, and a brown marble, with white veins, from Siberia. The said author, Ib. Supplem. ad Cent. 2. p. 1261. N^o. 1. also exhibits another brown marble, with lucid spots, mostly whitish, from Saltzburg in Germany. Volkman, Silesia Subterr. p. 38. mentions a liver coloured marble, with white undulated veins, to be found at Ulberfsdorff near Liebenau, which belongs to the monastery of Grissau, in Silesia; and Woodw. Cat. A. * b. 16. also mentions a fragment of marble, the ground of a yellowish brown, veined with white, he found on the shores of Lincolnshire, betwixt Skegness and Ingoldmels: All which marbles are probably of this specis.

XLVI. *Marmor rubrum, maculis oculiformibus albis.*

Occhio di Pavone Antico, Italice.

This is a very beautiful and elegant marble, of a fine bright cinnabarine colour, variegated with spots, and large irregular veins, of a milk white opaque spar. Numbers of the spots form circles of the size of a six-pence, which are filled with the red ground, and which, from their imaginary resemblance to eyes, have obtained this marble the vulgar name of the *peacock's eye*. It is capable of a very elegant polish, but it's surface is generally much crack'd or flaw'd, it is heavy, moderately hard, and of a solid texture, but not very compact or fine, and will not strike fire with steel.

I have also seen many specimens of a like marble, which I never found to be spotted in the manner above described, but only variegated with clouds or large spots of a milk white opaque spar, and which, as it does not otherwise differ from the above marble, I do not doubt is only a variety of the same species.

This marble is dug in some parts of Italy, and is greatly esteemed.

The Mus. Richter. p. 199. exhibits a *marmor rufum oculatum Salisburgense*, which perhaps may be of this species of marble.

XLVII. *Marmor rubrum albo maculatum porphyriti simile.*

Rosso brecciato antico, Italice.

Brocatello rosso, coloris obscure rubri punctis albis conspersi, antiquum, ex Italia, et Marmor ex brunno rubrum, maculis albis, antiquum Italicum; et Marmor lucide rubrum

rubrum cum similibus maculis Antiq. Ital. Bruckm. Epist. Itin. Cent. II. Ep. 25. p. 235. N°. 13. and Ep. 26. p. 246. N°. 21 and 22.

This marble is of a fine purplish red colour, like porphyry, but deeper, and more agreeable, and is pretty thickly spotted with small irregular spots of a fine white opaque spar, in the same manner as porphyry, and which stone, on first view, it greatly resembles; it is capable of a very fine polish, and even surface, and is a very beautiful marble; it is moderately heavy and hard, of a fine compact solid texture, and will not strike fire with steel.

It is an Italian marble.

Argenville, Tentam. Enum. Foss. Galliæ, p. 67. says, that the common marble of Languedoc is of a red ground, spotted with white; the said author, p. 98. also mentions a marble called *Douè*, from a chapel of the same name, between the cities of Nuits, and Beaune, in Burgundy, where it is dug; it is of a purple colour, with whitish spots. And Scheuchzer, Oryctogr. Helvetica, p. 122 and 124. exhibits a reddish marble spotted with white, and a purple marble with white spots of various sizes found in the Canton of Bern, all which marbles are probably of this species.

XLVIII. *Marmor obscure purpureum livido variegatum.*

This has a coarse look, and is not an agreeable or pretty marble; its ground is of a brownish purple colour, variegated with large irregular spaces or clouds of a greyish livid colour, and generally also with some few small spots of white; it is capable of a fine polish, and a very smooth surface; its texture is compact and solid, it is moderately heavy and hard, and will not strike fire with steel.

The quarries of this marble are in Italy.

XLIX. *Marmor obscure fuscum rubro maculatum.*

This is not a pretty or agreeable marble, nor is it capable of a good polish, though it admits a very smooth even surface; the ground is of a deep dull brown colour, with streaks or lines of a darker shade, and is thickly spotted with small irregular spots, of a fine pale red colour; it is moderately hard and heavy, of a fine compact, solid texture, and not quite destitute of brightness; it will not strike fire with steel, and burns to a pale brown, or clay colour.

I received this marble from Franconia.

Argenville, Tentam. Enum. Foss. Galliæ, p. 53. mentions a brownish marble, with red spots, but of a good politure, to be found at a place called Signan, in Guienne, which probably may be of this species.

L. *Marmor elegantissimum purpureum aureo scriptum.*

Garatronius. Imperat. Hist. Nat. l. 24. c. 25. Worm. Mus. p. 44. Charlt. de Foss. p. 246. N°. 3.

This

This is an elegant and very beautiful marble, its ground is of a fine purple, lineated or streak'd with slight veins of a high yellow or gold colour, the yellow streaks run so irregular, as to appear like characters or writing, which, from their various windings, are fancied to resemble the Arabic letters. It is capable of a fine polish, and even surface, is moderately hard, of a firm compact solid texture, will not strike fire with steel, and readily calcines.

Authors do not inform us where this marble is dug; but Imperatus and Wormius tell us, that in Asia it is greatly valued and worn as ornaments, and for hilts of daggers, swords, &c.

OBSERVATIONS on the BROWN and RED variegated MARBLES.

Besides the species of brown and red variegated marbles here described, the following sorts are slightly mentioned by authors.

A very elegant marble, of a fine brown colour, variegated with black, is dug near the city Hof, in the margraviate of Bayreuth; Bruckm. Magn. Dei in locis subterr. Vol. II. p. 145. and Epist. Itin. Cent. I. Ep. 24. p. 4. N^o. 16. and Ephem. Nat. Curios. Vol. v. p. 106. Obs. 27.

A red marble with black veins, is dug in the bailiwick of Burgk, in Voigtland, Ephem. Nat. Curios. l. c.

A marble called *Breche*, of a deer coloured ground, thickly set with white spots, is found at the village *Chenove*, a mile from the city Dijon in Burgundy, Argenville, Tentam. Enum. Foss. Galliae, p. 98.

Red marbles variegated with white, are found in many places, viz. in the Auw a league from Einsidlen, in the Canton of Switz, Scheuchz. Oryctogr. Helvetica, p. 124. at Ratisbon, Kentm. Nom. Foss. p. 54. N^o 4. at the village Badra, in the Principality of Schwartzburg, Bruckm. Epist. Itin. Cent. II. Ep. 26. p. 251. N^o. 91. at Obernig in Silesia, Volkm. Silesia. subterr. p. 37. in Picardy, where it is called *Macarne*; at a place called St. Barthevin, near Laval, in the province le Mans; in the city of Narbonne, the marbles are of a rosy colour, variegated with white veins, and near the city of Namur, where the red and whitish marble is called *Charlemont*; Argenville, Tentam. Enum. Foss. Galliae, p. 11. 28. 119 and 129.

A light brown marble, variegated with fine veins of grey, is dug in the quarry called Seydelsbruch, on the Geigen, near the city Hof, in the Margraviate of Bayreuth, Bruckm. Magn. Dei in locis subterr. Vol. II. p. 145. and Epist. Itin. Cent. I. Ep. 24. p. 4. N^o. 15.

A dark red marble, with large lucid grey spots, and another dark red marble with few grey spots, are dug at the village Badra, in the principality of Schwartzburg, Bruckm. Epist. Itin. Cent. II. Ep. 26. p. 251. N^o. 88 and 92.

A flesh coloured marble, with greenish grey veins, is dug on the Fichtelberg in Franconia, Bruckm. Ib. Supplem. ad Cent. II. p. 1261. N^o. 6.

A brown and yellow variegated marble, is dug at the village Gattendorff, half a league from the city Hof, in the Margraviate of Bayreuth, Bruckm. Epist. Itin. Cent. I. Ep. 24. p. 5. N^o. 21 and 22.

A marble variegated with deep brown and deep green, is got at Hall in Saxony, Bruckm. Ib. supplem. ad Cent. II. p. 1263. N^o. 20.

Another

Another of a light brown colour, veined with green, is dug on the Geigen, near the city Hof, Bruckm. Ib. Cent. I. Ep. 24. p. 7. N°. 49, & Ephem. Nat. Curios. l. c. and a quarry of a liver coloured marble, finely variegated with green veins, has been lately discovered between Berg and Reitzenstein, near Mohrenhausz, on the Fichtelberg in Franconia, Bruckm. Ib. Ep. 25. p. 3. N°. 66.

S E C T. V. *Yellow Marbles variegated with other colours.*

LI. *Marmor fulvum nigro variegatum.*

THIS marble is of a dull, deep, or somewhat brownish yellow colour, prodigious thickly variegated with dots, streaks, and spots of black, which often form rude ramifications; it is not capable of any polish, but bears a very fine smooth surface, and is a very pretty marble; it sometimes (though extremely rare) contains a few figured fossils, and in some blocks I have observed some few asteriæ very perfect and fair, and quite composed of a milk white opaque spar, and some few small belemnites; it is very heavy, of a moderate hardness, and will not strike fire with steel; its texture is very coarse and harsh, quite destitute of the least brightness, and exactly resembles a hardened cretaceous substance, and has not the least stony appearance; it is composed of the deep yellow, a whitish, and black substance, all irregularly concreted together, and burns in some parts to a pale brownish white, and in other parts to a reddish colour.

The quarries of this marble, which were first discovered about the year 1742, are at Yeovil in Somersetshire; and I have seen in that county, very elegant tables, and other ornamental works of it.

Argenville, Tentam. Enum. Foss. Gallia, p. 10. mentions a dull yellow marble, spotted with black, which admits but a middling polish, to be dug in Picardy, in the territory of Marquise near Ambleteuse, where it is called *Stingal*, the said marble probably is of this same species.

LII. *Marmor flavum rubro variegatum.*

Marmor in rubro luteum recens, Rosso e giallo moderno, Mus. Richter. p. 197. Giallo brecciato antico, Italice.

The ground of this marble is of a fine yellow or gold colour, spotted and veined, but not much, with dark brownish red, and it also generally has some few spots of white; it is a beautiful marble, is capable of a very fine polish, and of a smooth surface, is heavy, moderately hard, and will not strike fire with steel, its texture is very fine, compact, and solid, and not destitute of brightness, but its red parts are coarse and ochreous.

I have also seen specimens of a marble, which though of a different ground colour, yet as it entirely answers to this species in all other particulars, I am inclined

inclined to think is only a variety of it; it is of a fine rosy flesh colour, yet always with a slight yellowish glance, and is spotted and veined with a dark purplish red, but in all other particulars it in no wise differs from the above; this variety is, as I take it, the *marmor varium venis in subluteo rubellis breccia gialla e rosina antica*, of the Mus. Richter. p. 194.

The quarries of this marble are in Italy.

Scheuchzer, Oryctogr. Helvetica, p. 122. mentions a yellow marble, variegated with spots of a yellowish brown, and to which he gives the name of *Giallo brecciato antico*, to be found in the Canton of Bern. And Argenville, Tentam. Enum. Foss. Galliae, p. 53. informs us of a marble called *d'Antin*, and also *Veyrede*, of a fine yellow colour, spotted with red, which is found in the territory of Bigorre, in the province of Guienne, both which marbles may justly be referred to this species.

LIII. *Marmor elegantissimum luteum venis purpureis variegatum.*

An porta santa, Imperat. Hist. Nat. l. 25. c. 8.?

An marmor varium de Septem basibus dictum, Breccia di sette base antica. Mus. Richter. p. 194.?

An marmor in aureo varium, telæ aureæ nomine veniens, l. c. p. 199?

This is a most elegant and beautiful marble, of a fine bright yellow colour, thickly variegated with irregular veins and spots of purple, and spots or spaces of fine pellucid crystallized spar, and also of semipellucid spar; its polish is admirable, and equal to that of the finest agate, but its surface is not perfectly smooth, being generally somewhat flawed; it is heavy and hard, is of a fine solid compact texture, not quite destitute of brightness, and will not strike fire with steel.

It is an Italian marble; and is one of the kinds they call *Brocatello*.

LIV. *Marmor flavum ceruleo variegatum.*

Marmor variegatum flavo ceruleum. Hill's Hist. Foss. p. 478. N°. 2.

This marble is of a deep strong yellow ground, *brecciated* or inlaid with pieces of a different substance, generally of a dark blue colour, near black, but sometimes greyish; they are mostly large, and no where touch or communicate together, but are lodged separate, and at distances in the mass; its texture is coarse and harsh, and not very compact; it is heavy and very hard, and is not capable of a good polish; it will not strike fire with steel, and its blue parts burn to a pale grey, and the yellow or ground, to a dusky red colour.

It is brought to us from Italy, but is not much esteemed by our workmen, because of the difficulty of giving it a regular polish.

OBSERVATIONS on the YELLOW variegated MARBLES.

Besides the species of yellow variegated marbles here described, the following sorts are slightly mentioned by authors.

F f

A greenish

A greenish yellow marble, with white veins, is found in Silesia; there are ornamental works of this marble in St. Mary Magdalene's Church, in the city of Breslau; Volkm. Silesia subterr. p. 37.

A fine bright yellow marble, with snow-white spots, is dug at Streitberg in the Margraviate of Bayreuth, and is greatly esteemed; Bruckm. Epist. Itin. Cent. I. Ep. 24. p. 7. N°. 47.

A yellow marble, spotted with grey, is dug at Gera in Voigtland; l. c. Cent. II. Ep. 26. p. 249. N°. 69.

A yellow marble, spotted and veined with brown, is found on the Fichtelberg in Franconia; l. c. Supplem. ad Cent. II. p. 1261. N°. 4.

A fine yellowish marble, with small red spots or specks, is dug in the iron mine near Cappeler Hof, in the prefecture of Baden in Switzerland; Scheuchzer's Oryctogr. Helvetica, p. 126. and Woodw. Cat. L. 8. 1.

SECT. VI. *Green Marbles variegated with other colours.*

LV. *Marmor viride albo variegatum.*

There is no species of marble of two colours only, which has so many varieties as this, and the varieties are also so remarkably different, that to give an accurate and just account of the species, I cannot omit giving particular descriptions of its chief varieties, which are,

First, the Egyptian marble, so called by our masons, because brought from Egypt, and is generally shipt at Alexandria; it is much esteemed and used for tables, and other ornamental works. This is the *Marmor Tiberium* and *Augustum* of the antients, of which Pliny, *Hist. Nat.* l. xxxvi. c. 7. informs us, that from the disposition and order of their variegations, they were so called from the Emperors Augustus and Tiberius, in whose reigns they were first brought from Egypt, and used in ornamental works. These two marbles were evidently the same species, and only differed in the distribution of their white veins; those blocks in which the variegations were waved and thrown into circular figures, they called the *Marmor Augustum*; and those whose white was not thus ranged, but was diffused and scattered through the whole mass, was the *Marmor Tiberium*.

The later writers on fossils all mention these marbles by the same names, but have not added any farther description or account of them, and many have also called them *Verde antique*, a vague name, which they have likewise given to all the varieties of this species, as well as to green and white marbles in general.

The ground colour of this marble is of a dark dusky green, near black, with spots and veins of a lighter green, and multitudes of small and also very broad and large veins of opaque white spar. These sparry veins are sometimes quite white, but generally have a greenish tint; and very often this marble has also vast numbers of streaks and small spaces, of a pale dull brownish hue, which appear coarse and terrestrial, and bear no polish; the polish of the whole marble is good, but it never bears an equal or smooth surface, having always many
breaks

breaks or flaws on it; it is extremely heavy, and very hard, and is a coarse though very agreeable marble, on account of its pleasing variety.

The texture of this marble is not granulated, but all its different parts are firm and compact; the white parts, which are of pure white opaque spar, are very glittering and bright; the green marbly parts, or those greatly saturated with spar, as well as those which are of a fine jasper-like substance, are not quite destitute of brightness; and the micaceous parts, which lie interspersed in pretty large bundles, are very flakey or foliaceous, fair and of a deep green colour, near black, and are very glossy; all these different substances are intimately mix'd and interwoven among one another, though not blended together, and form a mass of a very rude, irregular, and various texture.

This marble will not strike fire with steel, and it burns to a very friable pale brownish whitish hue.

With aqua fortis it ferments briskly in most parts of it, which are those parts that are sparry, or greatly saturated with spar; but the jasper-like and the micaceous parts, which are not few, are not at all acted upon by menstrua; the like observation may be made on all the varieties of this marble, for in all of them there are substances of the same nature, which do not ferment at all with acids.

The second variety is generally of a fine beautiful deep and light grass green ground, variously and irregularly blended together, and beautifully variegated with large clouds, and spots of milk white opaque spar; sometimes the greens are not so fine, but the slabs are coloured only with deep and light greens, and an olive green, all blended together, and in like manner variegated with white clouds and spots: it is capable of a fine polish, and of a very smooth surface, is not of so rude and irregular a texture, but chiefly firm and compact, and oftentimes has parts or veins, which are of a bright glossy and flakey appearance, but the flakes are very small; it is hard and heavy, and is a very beautiful marble. This variety is most generally called the true *Verde antico*, and is found in the antient ruins in Italy; and there are quarries of it in the Genoese territories.

The third variety is the kind now dug in Piedmont; it is a very elegant and beautiful marble, generally of a greenish ground, thickly *brecciated* or inlaid with spaces of light green and dark green, near black, and large variegations of milk white opaque spar; the blackish green parts are quite coarse and opaque, and appear somewhat talcey and flakey, and much asbestos is also oftentimes found in the marble; the rest of the marble is of a moderately fine, firm, solid texture, is capable of a fine polish, and of a pretty smooth surface, is moderately heavy and hard, and will not strike fire with steel.

The quarries of this marble are about three miles from Susa, and twenty one miles W. N. W. from Turin. They are on the top of a high mountain, in a range of them; one of the first of the Alps that present themselves on the side of Turin; the king has caused works to be erected at the bottom of the mountain, for sawing and polishing the rough blocks: these works are moved by a torrent, that descends from above, and there is a tolerable winding road, which leads to the quarries, and the whole summit of the mountain is one immense rock of this kind of marble; the quarries as yet are not wrought very deep, and the quarry-men affirm, that the deeper they dig the marble is finer and of

a deeper green colour: in many parts of the mountain a green amianthus, of the same tint as the marble, and of different degrees of purity and hardness, is found in considerable quantities.

I have also seen marble of this very variety from Italy, by the name of *Verde di Ponsevera di Genova*.

The fourth variety is dug in Sweden. The Mus. Tessin, p. 119, synonyms it, *Marmor laconicum*, *f. M. varium ex albo et viridi*. This is a very beautiful marble, mostly of a very deep green ground, elegantly and thickly mottled or speckled with white opaque spar, and with some few veins of the same substance; and on a nice observation many small black spots also appear, which otherwise are hid by the darkness of the ground colour; these black spots seem somewhat talcy; it is capable of a fine polish, and of a very smooth surface, is heavy and moderately hard.

The quarries of this marble are in the mountains Kalmorden, near Norkoping, in the province of Ostrogothia.

These are the chief varieties of this marble, which, besides the places already mentioned, is found in several parts of Europe; in the northern part of the island of Anglesea in Wales, in the parish of Llan Fairying Hornwy, and in Inis Molroniad, or the island of sea calves, there are rocks of this kind of marble, with veins of fine asbestos; and a quarry of the same marble is dug near Kemlyn, and another at Monachty, in the same island.

Woodw. Cat. A. x. b. 3. exhibits a dusky green marble, veined with white, which he found in the way between Ambleside and Penrith in Cumberland, where it is in considerable quantity; it probably is of this same species.

Wallerius's Mineralogy, species 45. var. 7. mentions there are quarries of a green marble, variegated with white, grey, and yellow veins and spots, at Ostergyllen in Sweden; and Leopold's It. Suecicum, p. 101. also mentions a variegated green marble to be dug at Geddeholm in the said kingdom, both which marbles are probably varieties of this species.

LVI. *Marmor alterum viride albo variegatum.*

This marble is of an agreeable pale sea green colour, nearly uniform, or equally diffused, but sometimes with spaces of a dusky green, variegated with pretty large veins and spots of pure white opaque spar; it is capable of a very good polish, and of an even surface, and is a very pretty marble; it is moderately heavy and hard, of a fine uniform compact solid texture, and not quite destitute of brightness; it will not strike fire with steel, and burns to a sullied whitish colour.

It is said to be dug near Saltzburg in Germany.

LVII. *Marmor viride venis caeruleis variegatum.*

Marmor viride pratinum, *f. Verde di Prata*. Imperat. Hist. Nat. l. xxv. c. 8. Gimma, p. 19. Mus. Richter. p. 193.

This marble is of a yellowish green colour, variegated with blue veins, which in their disposition and size greatly resemble the veins in the human body; it is capable of a fine polish, and is much esteemed for ornamental works; the

the body of the marble calcines readily, but the blue veins endure the fire.

Gimma, instead of blue veins, as Imperatus describes it, says that this marble is variegated with red veins, which, however, he in the same manner compares to those of the human body.

This marble is dug near the fortress of Prata in Tuscany, from which place it derives its name.

OBSERVATIONS on the GREEN variegated MARBLES.

Besides the species of green variegated marbles here described, the following sorts are slightly mentioned by authors.

A green marble, sprinkled with black, is dug at Peterwitzin in the Neumarck. And a very hard green marble, thick set with dark coloured or blackish veins, is found near the Zottenberg, in the duchy of Schweidnitz in Silesia; Volkmann's Silesia Subterr. p. 37.

A green marble, veined with white, is dug in great quantities, near Rochlitz in Misnia, and is used in that country as a common building stone; Bruckm. Epist. Itin. Cent. I. Ep. 25. p. 13.

An olive green marble, with long yellow streaks like ribbands, is found at Trapani in Sicily; Argenville Oryctologie, p. 191.

DIVISION III.

Marbles variegated with many colours.

LVIII. *Marmor nigrum rubro albo flavoque variegatum.*

Marble, the ground black, veined with red, yellow, and white, from a quarry near Plymouth, Woodward Cat. E. b. 18.

Marble veined and spotted with black, white, red, and yellow, from a quarry near Torbay, l. c. b. 20.

Marmor nigerrimum venis rubris, albis & flavescens variegatum. Hill's Hist. Foss. p. 481. N° 5.

This marble is of a fine deep black ground, beautifully variegated with irregular veins of different shades of red, yellow, and white; it is capable of a good polish, and of an even surface, and is an elegant marble; its texture is very compact and solid, somewhat coarse or rough, and is not destitute of brightness; it is considerably heavy and hard, will not strike fire with steel, and burns to a pale grey.

There are quarries of this marble at Plymouth, and near Torbay, in Devonshire; and much of it is brought to London, and work'd into chimneys, tables, &c.

The Irish marble, or *Marmor nigricans venis albis et cinnabarinis*, of Hill's Hist. Foss. p. 481. N° 4. is only a variety of this species. The ground of this variety is sometimes greyish, and sometimes the white and black are in such equal quantity, that it cannot well be determined which is properly the ground; the variegations, for they are too irregular to be called veins, are of a fine white and of a high cinnabarine colour, but yellow veins there are none in the stone;

stone ; it is capable of a fine polish, and smooth surface, and is a very elegant marble ; in texture and all other particulars, it differs not from the English kind.

There are great quantities of this marble dug in Ireland ; it is much esteemed there, and it is sometimes brought into England, and used for ornamental works.

The following marbles mentioned by authors, may perhaps be of this species.

A foreign marble, of a blackish grey ground, beautifully variegated with red, flesh colour, and white. Woodw. Cat. I. γ 1.

A fine marble of a grey ground, beautifully variegated with spots and veins of red and yellow, and sometimes with other colours ; it is capable of a good polish, but is very frequently crackt or flawed ; this kind is found on the Heydenberg, near the village Puhlheim, in the territories of the imperial city of Nuremberg. Bayer's Supplem. Oryctogr. Noricæ, p. 43.

A grey marble, veined with white, and thickly spotted and clouded with an orange colour, and sometimes with bivalves in it, is dug at the village Belem near Osnabrug in Westphalia ; it is a very fine marble, of a hard compact texture, and is capable of an elegant polish, almost equal to that of an agat ; at the same place there are also dug two other varieties of it, of equal beauty, polish, and texture, one of which is grey variegated with black and yellow veins and cinnabarine spots ; the other is grey, clouded with yellow and spotted with red ; Bruckm. Epist. Itin. Cent. I. Ep. 25. p. 7. N° 4. and p. 8. N° 10. Idem, Magn. Dei in loc. Subterr. P. II. p. 231.

LIX. *Marmor album purpureo aliisque coloribus variegatum.*

Breccia di Saravazza, Italice.

Marmor albo purpureum variegatum. Hill's Hist. Foss. p. 473. N° 1.

This marble is so variously variegated, that scarcely two pieces can be found which agree ; the ground is generally white, and is veined, spotted and variegated with purple of all degrees of shades, and blotches of brown, ash, yellowish, greenish, and a variety of other colours ; at other times the purple makes the ground, and the white and other colours lie in spots, and large blotches ; its variegations are always extremely confused and irregular, and the different colours are not blended together, or do not form one solid mass, but are different concretions *brecciated* or inlaid in the body of the marble ; it is capable of a fine polish, and of a pretty smooth surface ; its texture is in general moderately fine, compact, and solid, but its different concretions are of very different degrees of purity and hardness, it is very common to see in this marble between the commissures of the different concretions, a flakey glossy substance, exactly resembling a small silvery mica, and is absolutely of a somewhat micaceous nature ; it is moderately hard and heavy, and is a fine and agreeable marble ; it will not strike fire with steel, and its different parts burn to various colours.

This is the most common Italian marble we have in England ; we import it in very great quantities, and it is in frequent use for all kinds of ornamental works.

The

The quarries of this marble are at Saravezza, a town in the Capitanato or Bailiwick of Pietra Santa, between Lucca and Carrara; the whole country is full of quarries of this and other kinds of marbles; they are all on the hills, and the quarries of this kind are chiefly at the bottom of the hills, about three miles from the town.

There are also quarries of this marble at Mogola or Moliola in Piedmont; and I have seen a fine variety of it, of a dark blackish brown ground, thickly set with spots and inlaid pieces of dark brown, and variegations and spots of white, and capable of a very elegant polish and smooth surface, from the margraviate of Bayreuth, or Culmbach, in Franconia.

Ireland also affords this marble. Smith's Nat. and Civil Hist. of the county of Cork, Vol. II. p. 375. informs us, it is dug in sufficient quantities, in many parts of that county, to supply any demand; as at Church town, near Michael's town, in the little island in Cork harbour, and a deeper coloured sort, but softer, near Middletown; the Irish sort is mostly of a purple ground, vein'd and spotted with white.

The following marbles mentioned by authors are perhaps of this species.

A dark red marble, with large white, ash, and yellowish spots, dug near the village Badra, in the duchy of Schwartzburg Sonderhausen, Bruckm. Epist. Itin. Cent. II. Ep. 26. p. 251. N° 88 a 95.

A very fine marble, variegated with brown, dark red, purple, yellow, white, and ash colours; the quarries of this marble are at Ellgerode in the Electorate of Hanover, l. c. p. 261. N° 269 & 270.

LX. *Marmor lividum albo et pallide rubro variegatum.*

The ground of this marble is of different shades of an agreeable dark ashen or leaden colour, variegated with some spots and veins of a fine white, and spots and streaks or lines of a fine pale red colour; it is capable of an elegant polish, and of a very even surface, and is a very beautiful marble; it is heavy and hard, of a very fine, compact, solid, uniform texture, and will not strike fire with steel.

It is an Italian marble, and is one of the kinds they call *Porta santa*.

LXI. *Marmor livido rubro alboque lineatum.*

This is a very pretty marble, it is variegated with a livid or bluish ashen colour, white, whitish, and pale red, all which colours run in streight lines, as if drawn with a ruler, without the least break or interruption of spots, veins, &c. but with no regularity in the disposition of the colours, for the livid, which are together, are very broad, and the other colours lie close together, and generally are narrower; it is capable of a fine polish, and of a very smooth surface; it is moderately heavy and hard, of a fine granulated texture, the granules very bright and glittering, like the Parian marble, and it will not strike fire with steel.

I received this marble from Italy, by the name of *Bigio a righe rosse e gialle Antico*.

LXII. *Marmor*

LXII. *Marmor cinereum albo et fusco variegatum.*

Marmor pallide fuscum venis albidis variegatum. Smith's Nat. and Civil Hist. of the county of Cork, Vol. II. p. 378.

This marble is so variously variegated, that scarcely two pieces can be found which nearly agree; in some blocks it is of a pale brown, like a mixture of white lead with a little umber, and of a mottled dove colour, having sometimes light veins, and in other parts darker shadings, and with white veins running through the whole marble; in other blocks it is of a blackish grey, or near a leaden colour, much disturbed by clouds of a lighter shade, and spots and spaces of white; and sometimes it is also variegated with veins and spots of black, and large spaces of a palish colour, slightly tinged with brown; in all these appearances the variegations are extremely confused and irregular; it is capable of a fine polish, and of a very smooth surface, and is a very agreeable, tho' not a beautiful marble, on account that its colours are not fine or striking to the eye; it is of a moderately fine compact texture, and of little brightness, is heavy and hard, and will not strike fire with steel.

There are great quarries of this kind at Kilcrea, eight miles west of the city of Cork in Ireland; and it is well known in that kingdom by the name of *Kilcrea marble*; it is much used in ornamental works; and great quantities of it are burnt near where it is dug, for the lime it yields is excellent.

LXIII. *Marmor livido-griseum albo flavo cinereo purpureoque variegatum.*

This is a very pretty marble; it is variegated in a most confused and irregular manner, with blotches, spots, and veins of a deep yellow, white, ash, dusky purple, and a very livid dark grey, with a purplish cast, which latter colour is in the greatest quantity, and may properly be called the ground; all these colours are rather dull than striking to the eye, and on that account the marble is not so beautiful as could be expected from such a variety of them; it is capable of a very good polish, and of a smooth surface, is very heavy and hard, of a fine compact solid texture, and not destitute of brightness, it will not strike fire with steel, and burns to a pale greyish white colour.

This marble is dug at Witton or Whetton in Derbyshire, but is not much known or used.

LXIV. *Marmor pallide fuscum, albo rubroque variegatum.*

Marmor pallide fuscum, venis albidis et rubentibus variegatum. Hill's Hist. Foss. p. 476. N^o. 1.

This marble is subject to great variation in its colours; sometimes the ground is of a fair brown, at other times it is tinged with an admixture of yellow, and sometimes it has a whitish cast; the veins, for its variegations are most generally in veins, also suffer different shades, in some places being of a pure, and in other parts of a bluish white; and the red is likewise of different degrees of colour, from a bright red to the purple of porphyry; it is capable of a fine polish, and of a smooth surface, and is a very pretty marble; its texture is compact

compact and solid, and not quite destitute of brightness, it is considerably heavy and hard, will not strike fire with steel, and suffers but little change in the fire.

Many tables, and other ornamental works, are made in London of this marble, and the mafons say it is dug in England; Hill asserts it is a common English marble, and is found in great abundance in Cornwall and Devonshire; and that there are also many quarries of it in Wales.

The following marbles mentioned by authors, may perhaps be of this species.

Marble, the ground of a pale brown colour, with veins of white spar, and some lines of a purple colour, from in Somersetshire; Woodward, Cat. A. x. b. 1.

Fragments of marble, worn and rounded by the agitation of the sea, variegated with brown, red, and white, from the shores at the Lands-end in Cornwall, l. c. * b. 7.

A marble, variegated with grey, white, and purple veins, from Freiberg, in the duchy of Schweidnitz in Silesia, Kundm. Cat. Rer. Nat. &c. p. 189. b. 96.

A dark brown marble, clouded with grey and bright red: there are quarries of this kind, on der Geigen, near the city Hof, in the Margraviate of Bayreuth, Ephem. Nat. Curios. Vol. v. p. 106. Obs. 27. & Bruckm. Epist. Itin. Cent. I. Ep. 24. p. 4. N°. 17.

LXV. *Marmor rubrum elegantissimum albo flavoque variegatum.*

Alabastrites, vel marmor, undis rubris diversis luteis albisque varium. Brocatello. Gimma, p. 12. § 23. Mus. Richter. p. 195.

An marmo alabastrino Avenato, alabaastro Brocatellio overo il Brocatello, Imperat. Hist. Nat. l. 25. c. 8.?

Brocatello ex albo, rubro et flavo marmoratum Hispanicum rarum, ex Italia, Bruckm. Epist. Itin. Cent. II. Ep. 25. p. 235. N°. 19.

Marmor rubrum, venis albescentibus et aureis variegatum, quod Brocatello Italicum, et marmor Thebaicum antiquorum. Hill's Hist. Foss. p. 488. N°. 1.

This is a very elegant and beautiful marble, and has a very gay appearance; it is of a fine red ground, veined and variegated with white and yellow; is capable of a very fine polish, and of a pretty smooth surface; is moderately hard and heavy, of a tolerably firm and solid texture, and will not strike fire with steel.

The gay appearance this marble makes, and the liveliness of its colours, has obtained it the name of *Brocatello*, or *Brocade*; which name however is also given to some other marbles, that have a like beautiful variety of colours.

It is said to be found in Italy and Spain.

Pott's Lithogeognosia, Vol. ii. p. 169. judiciously remarks the confusion among authors touching the *Brocatell* marble. Boet. de Boot de Lapid. et Gemm. c. 281. p. 506. makes it to be the *marmor Thebaicum* of the antients; and describes it to be red, spotted with drops of gold or yellow colour; the Italians, continues he, call it *Brocatello*, from its resemblance to gold and silk Brocade; and it is said, there are small columns of this marble in the cathedral, and in St. John's church at Pisa. Wallerius, species 45. Var. 3. makes the

Brocatell and *Porta sancta* the same marble, and says it is yellow, spotted with red and white; sometimes it is also variegated with other colours, and has likewise been found veined with white. This author, species 99. Var. 3. exhibits another *Brocatell* among the porphyries, which he synonyms *Porphyry rubens*, *lapidulis flavis*, *marmor Thebaicum*; and describes it to be red, with small yellow spots; and adds, that it is commonly placed among the marbles; this latter is the kind described by de Boot, and Pot also ranks it as a porphyry, and says it is commonly called *Brocatello rosso*, to distinguish it from other kinds of stones; to which the masons give the same name of *Brocatell*, tho' they differ intirely from porphyry, and are truly genuine marbles; according to Vignole, continues the same author, a great quantity of *Brocatell* is dug in Spain, and particularly in Andalusia, where the inhabitants make a great trade of it: in short, it is to be observed, that not only the antients, but the modern architects and sculptors give the same names to stones, without regarding their different natures, and consequently have applied, without distinction, the name of marbles and of *Brocatells*, to all kinds of stones, which have lively colours, and are capable of a fine polish.

Hill asserts this kind to be the *Thebaicum* of the antients; and strives to prove the *aureis guttis interstinctum* of Pliny, to be quite applicable to the yellow variegations in form of small spots, with which this marble, as he says, still found at Thebes, is beautified; he in this has carefully, tho' not correctly, copied de Boot's erroneous opinion. The said author is also erroneous in his annotations on this stone, in his translation of Theophrastus, p. 22. where he makes two kinds of Theban marble; one whereof is the *Brocatello* here described, the other he says, is extremely hard, variegated with black, white, and many other colours; and is the *Pyrrhopæcilus* and *Syenites* of Pliny, and the granite of the moderns.

On what foundations authors have asserted this marble, or even a kind of porphyry, to be the *marmor Thebaicum* of the antients, is to me unknown; certain it is we have no grounds for such an assertion; the porphyry was well known to the antients, by the same name; and their Theban marble, I have given some reasons to think, was the black and yellow marble already described N^o. 28.

The Mus. Richter. p. 194. exhibits a *Marmor varium aureis in rubro maculis*; *Marmo a giocce d'oro*, Gimma, p. 23. § 58. *Stygmites Becheri*, aliis fere imbrocatello antico, which is only a variety of this marble.

Mylius, Saxonia Subterr. P. I. p. 77. mentions a red marble, with black, white, and yellow veins, to be dug near Zwickau; and Argenville, Tentam. Enum. Foss. Galliæ, p. 97. informs us there are quarries of a red, white, and yellow variegated marble, near the city Montbart in Burgundy; which marbles may perhaps be of this species.

LXVI. *Marmor rubro albo viridique variegatum.*

This is a fine and beautiful marble, its chiefest or ground colour is a fine pale red, and is variegated with large spaces of white, which are interspersed with pale green veins and spots; sometimes spaces of a dark purple, of a coarse texture, and pieces of brassy marchasite are found in it; it is capable of a fine polish, and of an even surface; its texture is very fine, compact, and solid; it is moderately heavy and hard, and will not strike fire with steel.

This marble is said to be dug in Saxony.

Scheuchzer,

Scheuchzer, *Iter Alpinum*, II. p. 44. mentions masses of green and red marble, veined with white, to be found near the village Tintzen in Pundten in Switzerland; and Argenville, *Tentam. Enum. Foss. Galliae*, p. 52 & 53. mentions a green, red, and white marble, vulgarly called *Balcavaire*, to be found near the city St. Bertrand, in the county of le Cominge; and another, spotted and veined with the same colours, called *Ver Campan*, not far from the city Tarbes, in la Gascogne in Guienne; which marbles perhaps are of this species.

LXVII. *Marmor rubro albo aliisque coloribus variegatum.*

Marmor ex albo et rubro variegatum, vulgo Wurst Stein oder Speckstein. Bruckm. *Epist. Itin. Cent. I. Ep. 25. p. 13. Cent. II. Ep. 26. p. 251. N^o. 101. & Supplem. ad Cent. II. p. 1263. N^o. 24, 25, & 26. Liebknecht. Disc. de Diluvio maximo, &c. p. 55. Mus. Brackenhof, p. 10. Ephem. Nat. Curios. Vol. II. p. 80. Obs. 30.*

Marmor varium, quod a sarciminis secti similitudine Wurstein marmel dicitur, Mus. Richter. p. 199, 202, &c.

This marble is of that sort which is not composed of an uniform substance, but is a congeries of many concretions of different natures; its basis is always sparry, as are likewise many of the concretions, but it generally has also pebbles, talcy and crystalline concretions mixed with it; the parts of it are therefore of different degrees of purity and hardness; and trials by menstrua and fire shew various effects, according to the different natures of its several concretions.

The Italians have given to this sort of marbles, made up of concretions of different natures, the general name of *Breccia*, from which name, I have borrowed the term of *brecciated*, which I have used in some of the foregoing descriptions.

The most general appearance of this marble is red and white; the white parts are opaque, and much resemble suet; the red parts are exactly of the colour of the chopt meat with which sausages are filled, from which resemblance it has generally obtained the name of *Wurst Marmel*, i. e. *sausage marble*, among the Germans; however it is also often variegated with concretions of many other colours, as yellowish, brown, grey, black, &c. it is generally very hard and heavy, is capable of a good polish, and of a moderately smooth surface.

It is dug in many parts of Germany, principally at Weisenthal and Jobstbad in Misnia, and on the Nahrungsborg, and other places in the Landgraviate of Hesse Cassel.

Fragments of varieties of this marble are also frequently found scattered up and down in many places of Germany; particularly on the hilly tracts near Gießen in Wetteravia, and I have seen many such fragments from the shores of the Orkney islands.

LXVIII. *Marmor virescens venis maculisque albis et nigris variegatum.*

An verde meschio, Imperat. Hist. Nat. l. 25. c. 8.?

Cipollaccio, l. c. Ibid.

Cæpollinum, Mercat. Met. Vat. p. 352.

Marmor e prasio cinerei fere coloris, *Cipollinum vulgo antiquum*, *il Cipollino* ò *Cipollaccio antico*, Gimmæ, p. 16 & 30.

Marmor viride mixtum cepaceum nigris albisque maculis, *Hetr. il Cipollaccio*, ò *Pardiglio*, ò *Bigio Antico*; *Cipollino Antico*, Mus. Richter. p. 187, 192, & 193.

This marble is chiefly of a very pale leek-green coloured ground, variegated with large veins of white, and with some small fine black veins, which curl or undulate; the ground or green is pretty uniform in colour; it is capable of a very good polish, and of a very even surface, and in the whole is an agreeable marble; its texture is granulated, the granules large, bright, and semipellucid, and cohere pretty firmly together; it is moderately heavy and hard, and will not strike fire with steel.

This is the most general appearance of this marble, but it is also sometimes found diversified with ash, rust colour, &c. and the Mus. Richter. l. c. exhibits a variety of it, variegated with red, which he says is called *Verde moderno* o *Cipollino moderno* by the Italians.

This marble is dug in Italy, and derives its name of *Cipollaccio*, from its leek like colour; or, according to others, from its veins sometimes running within one another, like the coats of an onion.

Mercator and the Mus. Richter. take this marble to be the *Marmor carystium* of the antients, which was of the colour of the sea; its chief quarries were near Carystos in Eubœa, from whence it had its name; the poet Statius to describe the colour of the stone, as also the situation of the place, has given a good allusion in his *Undosa carystos*, and *Marmoreos pelagi fluctus imitata carystos*.

Scheuchzer, Oryctogr. Helvetica, p. 122, says, a pale green marble, variegated with dark green, dark purple, black, and white spots, is found in the canton of Bern; and Kundm. Cat. Rer. Nat. &c. p. 191. b. 156. & seq. mentions a green marble, variegated with black and white, to be dug in such great quantities in the duchy of Brieg in Silesia, that the inhabitants there build their common walls with it; which marbles may perhaps be of this species.

LXIX. *Marmor multicolor primum.*

Marmor Blanckenburgense, Bruckm. Epist. Itin. Cent. I. Ep. 26. p. 34. Ep. 37. p. 5. Tab. 1. Fig. 4. Cent. II. Ep. 26. p. 253. N°. 133. p. 254. N°. 141. a 181. Supplem. ad Cent. II. p. 1264. & ejusd. Obs. in dem Hamburgische Berichten Von Gelchrten Sachen, Anno 1745. p. 93.

This marble is variegated, veined, and spotted with many colours, as brown, red, yellow, white, grey, and green; sometimes whole masses of it are of a deep purple ground, spotted with crimson red, and with many spots, both large and small, of white opaque spar; among which jointed spots like entrochi, or the chrysalides of insects, sometimes occur; other blocks are found chiefly veined with yellow and red; others with white, green, and brown;

brown; and others with grey, white, and red; sometimes (but rarely) brassy cubic pyritæ; and also some *conchæ anomie* are found immersed in it; the varieties of the colourings of this marble are so numerous, that were it not that the blocks are dug from the same stratum, they might almost deserve to be reckoned as different species.

The colours are generally bright; it is capable of a fine polish, and of a smooth surface, and is a very beautiful marble; its texture is compact, solid, and uniform, and very bright or glittering; it is heavy and exceeding hard, will not strike fire with steel, and generally burns to a sullied white.

The best quarries of this marble are on the highway, between the villages of Rubeland and Huttenrode, a mile from Blanckenburg, in the duchy of the same name; the inhabitants formerly used it only as a flux in their iron furnaces till about the year 1714, when by polishing, it was first discovered to be a beautiful marble; and in 1721 the ducal chamber granted a patent to work it, and a water mill or work was accordingly erected on the river Buda, where now great quantities of the marble are wrought for tables, tombs, pillars, and various ornamental works, and even utensils.

LXX. *Marmor multicolor secundum.*

Marmo ardeſe, du Bergamaſque, Argenville, Oryctol. p. 195.

This is a very elegant and beautiful marble; it is irregularly variegated with black, ash, whitish, pale vine, fleshy red, and a great deal of fine bright red; it is capable of an admirable polish and smooth surface, little inferior to an agat; its texture is compact and solid, and not destitute of brightness; it is heavy and moderately hard, and will not strike fire with steel.

The specimens from which this description was made, were sent me from Italy, by the names of *Ardeſſe dell ſtato di Milano*, and *Breccia celeſte antica*.

LXXI. *Marmor multicolor tertium.*

This is a most beautiful and elegant marble; its polish is so exquisitely fine, and its surface so perfectly smooth, that it equals the finest agat.

The colours it is variegated with, are a fine deep red, a deep brown, a deep yellow, a livid colour, and an ivory white, with some spaces or spots of crystallized spar; these colours run lengthwise, or somewhat resembling veins, and are beautifully blended together; the white, which is opaque, and like ivory, is often in spots, and is likewise beautifully streakt with the other colours, and the yellow and livid colours, are in less quantity than the others.

This marble is quite opaque, of a fine solid texture, but has little brightness; all the colours form as many different coloured masses, or are somewhat *breciated* or inlaid; it is moderately heavy and hard, and will not strike fire with steel.

The specimen from which this description was made, was sent me from Italy, by the name of *Breccia di ſette baſe antica*. A name I find also given to other sorts of marbles.

I am informed that this marble is also dug in la Provence in France.

LXXII. *Marmor*

LXXII. *Marmor multicolor quartum.*

The chief or ground of this marble is green, of different shades, in spots and veins, irregularly variegated with coarse ash colour, and white opaque spar, also in veins and spots, and peices of a blood red jasper, which are *brecciated* or inlaid in the marble; it is not capable of a good polish, bears but a moderately smooth surface, and tho' variegated with such strong colours, is not beautiful; it is of a strong compact texture, quite opaque and destitute of brightness, is very heavy and hard, and will not strike fire with steel.

I was informed that it is dug in Saxony.

Agricola, de Nat. Foss. and the Mus. Richter. mention a marble variegated with red, white and green, intermixed with pieces of jasper, which may be referred to this species.

OBSERVATIONS on the MARBLES variegated with many colours.

Besides the marbles variegated with many colours here described, the following sorts, which seem to me to be different species, are slightly mentioned by authors.

White marble, finely variegated with dark brown and green spots, from Norkoping in Sweden, Bruckman Epist. Itin. Cent. II. Ep. 25. p. 238. N^o. 35.

Whitish marble, with great blue and greenish veins, is dug in the mountain Fauche, near the city of Perpignan, in le Roussillon, Argenville Tentam. Enum. Foss. Gallia, p. 116.

A very fine ash coloured marble, spotted with a lighter shade, and yellow, and streakt with black, is dug at Streitberg, in the margraviate of Bayreuth; Bruckm. l. c. Ep. 26. p. 244. N^o. 6, 7, & 8. Another marble, of a dark grey colour, veined with black and yellow, is found on the Fichtelberg in Franconia, l. c. Supplem. ad Cent. II. p. 1261. N^o. 3. An ashen marble, veined with black and yellowish white, is dug on the Zottenberg, in the duchy of Schweidnitz in Silesia, Schwenkfelt, Cat. Foss. Silesia, p. 385. and a fine grey marble, variegated with black spots, and yellow and lucid veins, is found in the city of St. Maximin in la Provence, and is vulgarly called *marble of St. Maximin*, Argenville, l. c. p. 79. all which marbles are probably of the same species.

A Saxon ash coloured marble, veined with green and spotted with red, is exhibited in the Mus. Richter. p. 198. and a grey marble, clouded with brown and green, is dug near the city Plauen in Voigtland, which perhaps is only a variety of it, Ephem. Nat. Curios. Vol. v. p. 106. Obs. 27.

A very fine light grey marble, with dark grey, white, and black veins, and spotted with blood colour, and is sometimes also found only veined with dark grey, and spotted with high red, is dug on the Eigelberg, in the margraviate of Bayreuth; Bruckm. l. c. Cent. I. Ep. 24. p. 6. N^o. 32 & 33. Ejusd. Magn. Dei in loc. Subterr. P. II. p. 166.

A marble of a grey ground, with white, yellowish, sand coloured, and golden spots, is found at a place called Courlon, near the city Dijon in Burgundy; Argenville, l. c. p. 98.

A blood

A blood coloured marble, with large white veins and streaks of black, is dug near Altenau, a town two leagues distant from the imperial city of Goslar; another very hard red marble with cinnabarine spots, and some few black veins, is also dug at the same place, Bruckm. l. c. Cent. I. Ep. 26. p. 5. N^o. 1 & 2. red marble with grey spots and white veins from Saxony, and the Hartz, is exhibited by the Mus. Richter. p. 198. A red marble, variegated with black and white, is found in the province le Mans; and another red marble, variegated with blue and white, in the diocese of Cahors in Guienne; Argenville, l. c. p. 27 & 52. all which marbles are probably varieties of the same species.

A marble of a porphyry coloured ground, with large black and white spots, is dug near the city of Namur in Flanders, and is called *Bresche de Florennes*; Argenville, l. c. p. 129.

A yellow marble, variegated with red and white spots, is dug in the province le Mans; where it is vulgarly called *Sablè*; Argenville, l. c. p. 26.

A marble of a blue ground, spotted with grey, black, and red, is found at a place called Bourbon l'Archambaut; and also near the city Moulins, in the Bourbonnois; and another bluish marble, spotted with black, and with streaks or slight veins of pale red, which probably is only a variety of it, is found at the same place; Argenville, l. c. p. 93.

A marble of a blue ground, with veins of a sandy and golden colour, is dug in the abbey of Ogny at Chatillon sur Seine in Burgundy; Argenville, l. c. p. 98.

A dark green marble, variegated with grey spots and slight veins of black, is found on the Fichtelberg in Franconia; Bruckman, l. c. supplem. ad Cent. II. p. 1262. N^o 8.

A marble of an olive colour, thickly sprinkled with reddish specks, and white spots; there are quarries of this marble, at a place called Baunre la Roche in Burgundy; Argenville, l. c. p. 97.

Marble, clouded with brown and blue, and speckled with small black spots, is dug on the Geigen near the city Hof, in the margraviate of Bayreuth; Ephem. Nat. Curios. Vol. v. p. 106. Obs. 27. and Bruckm. l. c. Cent. I. Ep. 24. p. 7. N^o. 50.

A fine variegated marble is dug at the village Regeldorff, near Ratisbon; it is very hard, and is capable of a very fine polish; it is sometimes of a yellowish ground, at other times yellow, and sometimes liver coloured, elegantly variegated with many other colours; it is much used for ornamental works, and bears a great price; there are also quarries of this marble at a place called Weldenburg, near the said city; Bruckman, l. c. Ep. 25. p. 11.

A ball of Onychine marble, on one side sand coloured, on the other grey. That which is observable is this, that instead of veins, &c. it hath several circles one within another, as if drawn with a pair of compasses, on a slate, or as in the onyx, from whence I have named it; the biggest circle is about an inch and a half in diameter; Grew's Mus. Reg. Soc. p. 315. & Tab. 22.

DIVISION IV.

Marbles containing shells, corals, and other extraneous bodies.

LXXIII. *Marmor nigrum coralliis refertum.*

Black coralloid marble from Wales, Woodward, Cat. A. x. b. 62.

Marmor coralliticum nigerrimum conchyliis aspersum, et marmor coralliticum durius cinereo-nigrescens, Hill's Hist. Foss. p. 472. N^o. 1 & 2. Smith's Nat. and Civil Hist. of the county of Cork, Vol. II. p. 375.

This marble is generally of a fine black colour, of a compact solid texture, and bright or glittering, very heavy and hard, is capable of a fine polish, and of a smooth surface, will not strike fire with steel, and burns to a pure white colour.

It is thick set with coralloid fungitæ, lodged in different positions, so that the sides of some, and the ends of others appear; they are of several sizes, but generally very large, sometimes near two inches in length, and of the diameter of crown peices, but of half that bigness are very common; they are of a curious beautiful structure, being composed of many fine thin longitudinal plates, tending from their axis to their circumference, which are intersected by other numerous, fine, thin, transverse, or horizontal plates, and consequently the whole internal structure of the fungites is divided into small square cavities, which form a most elegant net-work; these coralloids are now composed of a whitish opaque spar, which fills intirely their interior texture, and they are capable of an equal polish with the marble, which being of a fine black colour, and these white, and of a curious structure, make together a most beautiful and elegant marble.

Sometimes this marble has also many white sparry casts of shells, both turbinated and bivalve; but that is not common, and is only observable in the sort dug at Kilkenny.

Dr. Woodward informs us, that this marble is dug in Wales; and adds, that the tomb of Sir Thomas Gresham Baronet, founder of the Royal Exchange, and of Gresham college, in great St. Helen's church in Bishopsgate street, is built of this marble.

The chief place where it is now dug, is about half a mile from Kilkenny in Ireland; the quarry is vast, having been workt many years; the antient cathedral of St. Kenny there is supported by pillars of this marble, which are now painted over; the ground above the quarry is filled with immense quantities of small masses or nodules of this same marble, no wise different from what is found in strata in the quarry, and with these the streets of Kilkenny are paved, a circumstance that the inhabitants boast greatly of.

It is also found, according to Smith, near Church town, on the earl of Egmont's estate, and near Doneraile in the county of Cork.

Great quantities of this marble have, of late years, been brought to London from Kilkenny, and used for ornamental works.

LXXIV. *Marmor*

LXXIV. *Marmor nigrum conchyliis varii generis refertum.*

Marmor orientale, pæcion, f. polymorphites, Aldrovandi in Mus. Metall. Lumbella scura Antica. Mus. Richter. p. 193.

This marble is of the same nature as the last described, but is never found with coralloids; it is only thick set with shells of various kinds, sometimes both turbinated and bivalves together, at other times only turbinated shells, and at other times only with bivalves, which are generally of that tribe hitherto called *conchæ anomie*: these shells are lodged in all directions; there are very seldom remains of the shells, but are only fine casts of white opaque spar; the stone, as also the shells, are generally capable of a very fine polish, and of an even surface, and form together a very beautiful marble.

There are quarries of this marble, in some parts of Germany, particularly at the village Belem, a league from the city of Osnabrug in Westphalia; but nodules, masses, or fragments, torn and broken from their original strata, are very frequent in many places, and which are all to be referred to this species of marble.

LXXV. *Marmor obscure cinereum orthoceratitibus refertum.*

This marble is generally of a dark brownish ashen colour, sometimes near black, the colour is so very dark; it is variegated with spots, both large and small, of milk white opaque spar, and has lodged in it, in all directions, casts of fine white opaque spar, of those concamerated shells hitherto called *alveoli, orthoceratitæ, or nautili recti*; these casts are not very thick set in the marble; they are of all sizes, from an inch to near a foot and a half long, of which length several are found, but the most common sizes are from one to six inches long, and they are not all of the same species, but eight or ten different species of that same genus of shells have been found imbedded in this marble. The different positions, in which they are found lodged, makes a very elegant appearance, sometimes the ends perfectly fine, with their siphunculus or funnel, are shewn; in other parts perpendicular sections of them appear, which shew their interior structure of different concamerations, and the funnel passing through them all in an elegant manner, and sometimes only their external parts are seen: they are generally very perfect and fair, few being found broken or otherwise damaged; these bodies, as well as the stone, take an admirable polish, and a very fine smooth surface, and form together a marble of surprizing beauty; it is heavy and moderately hard, and will not strike fire with steel.

This elegant marble is now dug at Königsaal, three leagues from the city of Prague in Bohemia; they make tables of it in that city, which for their elegance are sold at great prices.

Bruckman, Epist. Itin. Cent. II. Ep. 72. p. 902. mentions nodules or masses of grey stone, with orthoceratitæ of spar, which admit a good polish, to be frequently found in the neighbourhood of the castle of Suckow, in the Uckermark in Brandenburg, which masses may be referred to this species of marble.

LXXVI. *Marmor nigro-griseum, lentibus lapideis refertum.*

Scheuchzer, Oryctogr. Helvetica, p. 126. & 328. n. 959. It. Alpinum, III. p. 7. & Mus. Diluvianum, p. 95. N°. 959. and p. 96. N°. 973. a. Woodward Cat. M. p. 11.

This marble is of a blackish grey colour, veined with white, and is thick set with those figured fossil-marine remains, by lithographists called *lentes lapideæ* and *lapides numismales*, which are small bodies of a discoid form, convex on both sides, being thicker in the center, and lessening gradually till they terminate in an edge quite round, and on the flats or surfaces they have circles within one another, from the center to the circumference; these bodies are lodged in all directions in the marble, and are of all sizes, some so small that they are but just discernible, others near an inch over; their most general position is not flat, but lying on their edges, so that when the marble is cut and polished, they appear like small narrow leaves, seeds, &c. they are most generally composed of an opaque white spar, and as well as the marble are capable of a good polish; the stone is moderately hard and heavy, bears a good surface, and is a very pretty marble.

This kind is found in large rocks near the Cloister Pfefers in Sargas, one of the chief prefectures of the Switzers; there are several fine ornamental works of this marble in the church and cloister.

Loose masses or fragments of this marble, are also very frequent all over Switzerland, even on the tops of the highest mountains of that country; and like masses sometimes occur in Italy, and in some parts of Germany.

The resemblance the spots which these bodies form have to small narrow leaves, seeds, &c. by being placed edgewise, as has been already observed, have obtained the loose masses or fragments, in which they are thus lodged, the name of *lapides frumentarii* or *frumentales*; but when these same bodies are loose or lodged in the masses, so as to shew their flats or surfaces, they have then obtained the name of *lapides numismales*, from their resemblance to small coins; the various species of *lapides frumentales* & *numismales* of authors are very different masses of stoney, &c. matter in which these bodies, like all other marine remains, have been accidentally lodged; but there are particular sorts among them described by authors, that are evidently only fragments of this very species of marble, as e. g. of Imperat. Hist. Nat. l. xxiv. c. 25. & fig. where, speaking of the *pietra frumentale*, he says, they are only bodies petrified and concreted together by a marmoreous substance, which is calcareous, and of the genus of marbles, is capable of a good polish, and some of it is of a grey colour; in like manner the *Salicites Helveticus niger foliolis candidis*; the *Lapis frumentarius Helveticus niger semina melonum, cumini cum cochlitulis albis referens*, the *Lapis frumentarius Helveticus cinereus semina melonum, anisi, &c. referens*; and the *Lap. frum. Helv. maximus cinereus figuris longissimis*, of Langius's Hist. Lapid. figurat. Helvetiæ, p. 69. where he figures the three first sorts, Tab. 18. are only fragments of this marble, wherein these bodies are lodged edgewise; and the *Lapis frumentarius Helveticus cinereus, figuris levibus, et rotundis latissimis*, of the said author, ibid. is a fragment wherein the bodies are

are placed on their flats or surfaces : and many like specimens are also exhibited by several other authors.

LXXVII. *Marmor viridi-cinereum cochleis refertum.*

Petworth marble. Woodward Cat. A. x. b. 60.

Marmor cinereo-virens, conchyliis paucioribus refertum ; marmor fusile vulgo. Hill's Hist. Foss. p. 471. N°. 2.

This is a somewhat rough and coarse marble, of a grey colour, with a cast of green, it is not capable of a good polish, and bears a rugged surface, being vastly full of hollows, flaws, &c. on account of the interstices between the shells not being always perfectly filled up with the marbly substance ; its texture is very irregular, but very firm and compact, and not quite destitute of brightness ; it is hard and very heavy, will not strike fire with steel, and burns to a very pale brownish white colour.

This marble is a congeries of casts of shells, chiefly turbinated, the shelly parts far exceeding the marble substance in quantity, they are so very numerous, and so thickly laid ; they are lodged in all positions, and are generally very perfect and large, and are mostly of one species, which, according to all appearance is (as Dr. Woodward imagines them to be) of the species of river snails called by Dr. Lister, Hist. Cochl. Angliæ, p. 133. *Cochlea maxima fusca s. nigricans fasciata* ; and in his Hist. Conchyl. N°. 26. *Cochlea fasciata vivipara fluviatilis*, and some few bivalves also occur ; the casts are very finely moulded of opaque white spar, but the edges of numbers of them on the surfaces of the marble often appear like fine blackish streaks, and spiral figures.

The quarries of this marble are about four miles from Petworth, and also at North Chapel in Suffex ; it is not much used, for tho' a curious kind, yet it is not a very pretty marble.

The slender round scapi of the pillars of the abbey church in Westminster, says Dr. Woodward, and of the Temple church, are of this sort of marble ; so likewise are those of the cathedral church of Salisbury : some persons, continues the said author, that are less skilful in these matters, fancy these scapi, that occur in most of the larger gothic buildings of England, are artificial, and will have it, that they are a kind of fusil marble, cast in cylindric moulds. Any one, who shall confer the grain of the marble of those pillars, the spar and the shells of it, with those of this marble got in Suffex, will soon discern how little ground there is for that opinion ; and yet it has prevailed very generally ; Camden, in his Britannia, had entertained the same notion of those vast stones of Stone-henge, but is fully refuted by Inigo Jones, in his Stone-henge restored. Thus far Dr. Woodward : to which we may add, against the notion of any fusil marbles whatever, the impossibility of rendering any calcareous substances fusible *per se*.

LXXVIII. *Marmor fusco-cinereum entrochis refertum.*

Marble with entrochi from the Peak in Derbyshire. Woodward Cat. A. x. b. 61.

Marmor albido-fuscum, entrochis aspersum : quod marmor fuscum Derbienne vulgo. Hill's Hist. Foss. p. 469. N°. 1.

This is a very elegant and beautiful marble; it is generally of an ashen coloured ground, sometimes very pale, at other times very dark, with a strong cast of brown; it is capable of a very fine polish, and of a smooth surface; its texture is very firm, compact and solid, but is quite destitute of brightness in its marbly parts; it is very heavy and hard, will not strike fire with steel, and calcines to a snow-white lime.

This marble is always thick set with entrochi, and sometimes a few shells of that genus called hitherto *conchæ anomia*, and some coralloids, and they greatly exceed the marble substance in quantity; they are lodged in the stone in all directions, and make a very elegant appearance, by the various forms in which they shew themselves in it when cut; they are of all sizes, and of several sorts, sometimes very perfect, but generally much broken and damaged, their perpendicular sections curiously shew their internal structure, of a dentated central cavity, which generally is filled with a brownish semipellucid spar, the entrochi themselves being mostly composed of a whitish opaque glossy and flakey spar; they take an equal polish with the marble, and, when the stone is rough, are extremely glossy and flakey, which does not at all appear when polished.

The whole metallic tract of the county of Derby is as it were one continual quarry of this kind of marble, for most of the strata of limestone are of this kind, and it is the common stone they burn, for it yields an excellent lime; the upper parts of these strata are always full of most amazing quantities of these bodies, and other marine remains, which seem to have been thus lodged by subsidence; and to have formed a crust over the limestone, this crust is generally of a very great thickness, and when they have passed it, they find the limestone to contain fewer marine remains, and at great depths it even becomes quite pure and free from them; this observation is confirmed by view of many places in Derbyshire, but particularly the limestone pits at Critche, and in any other places where they are sinking shafts for lead mines; the limestone and marine remains are not always of equal fineness and perfection, and on that account it is that this marble is more particularly got in some places, as at Rickledale, Monyash, Breks, &c. than in others, tho' all the strata, if cut and polished, would prove to be the same marble, tho' not equally beautiful and elegant in all places.

This marble is not only common in Derbyshire, but is as frequent in most other metallic tracts of this kingdom, Yorkshire, Wales, &c. equally abound with it; the limestone strata over the lead veins in those countries are this very marble; but as no trials have hitherto been made to work it as marble, it is degraded by the common name of limestone, and the country people, ignorant of its value as such, burn it only for lime, tho' its elegance and beauty brings it in competition with the most celebrated and valuable foreign marbles.

Great quantities of this marble are now used for tables, chimney pieces, and other ornamental works.

LXXIX. *Marmor pallide fuscum conchyliis refertum.*

This is an agreeable tho' not a beautiful marble, of a pale brown or clay coloured ground, with some small spots of brown and of a rust colour, and streaks or spots of semipellucid spar, which latter are only the edges and casts of the shells lodged in the marble; they are numerous, very small, some so minute that they are but just discernible, all much broken and damaged, and seem to be both turbinated and bivalve; it is capable of a very elegant polish, and of a fine smooth surface, its texture is fine, compact, and solid; it is moderately hard and heavy, and will not strike fire with steel.

I received the specimens, from which this description was made, from Voigtland.

LXXX. *Marmor nigro-fuscum conchyliis refertum.*

This marble is of a dark reddish brown or chocolate colour, variegated with numerous white semicircular streaks, which are the edges of the sparry casts of shells, which are imbedded in the marble; they are in near equal quantity with the marble substance, are small, very much crushed and broken, or mere fragments, and seem all to be bivalves, and are composed of fine white spar; it is capable of a good polish, and of a smooth surface, and is a pretty marble; its texture is very compact and solid, and very bright or glittering; it is heavy and hard, will not strike fire with steel, and burns to a whitish colour.

This marble, I am informed, has been lately discovered, and dug near Leith in Scotland.

LXXXI. *Marmor cinereo-flavesceus conchyliis refertum.*

Marmor orientale polymorphites nigris in luteo maculis, Lumachella dorato antica, Mus. Richter. p. 193.

Marmor orientale in flavente varium, polymorphites, Lumachel lacinerea, l. c. Ibid. et Marmor in luteo rubellum crystallinis venis distinctum, polymorphitæ genus, Lumachella gialla e rossa con vene saligne, l. c. p. 194.

This is of an ashen yellowish ground, very thickly and agreeably variegated with veins, spots and streaks of black and of spar, which are only the edges of the shells and of their sparry casts, which are imbedded in this marble in very great quantities, and greatly exceed the marble substance; these shells (for many of the shells yet remain) and their casts, are all small, and are mostly of the oyster tribe; they are generally lodged in a horizontal manner, or on their flat surfaces, so as to compose many layers or beds of them, and are mostly fair or well preserved; it is capable of a good polish, but the surface has generally many hollows and flaws, occasioned by the marbly substance not perfectly filling up in several places the interstices between the shells; its texture is somewhat coarse, but very compact; it is moderately heavy and hard, will not strike fire with steel, and burns to a pale whitish colour.

The quarries of this marble are in Whichwood forest, between Burford and Cherberry in Oxfordshire; but it rises in such small masses as not to be of any great use.

I have also received this marble from Italy, by the vague name of *Brocatello di Francia*, the ground colour of it was of a dull yellow, with a strong cast of flesh colour in many places, and the shells were shattered and lodged in all positions.

Masses or loose fragments of varieties of this marble are found in some parts of Germany. Bruckman, *Epist. Itin. Cent. II. Ep. 26. p. 247. N°. 38. Ep. 72. p. 902. and Supplem. ad Cent. II. p. 1262. N°. 12 & 13.* exhibits such masses from Maffel in Silesia, from the castle of Suckow in the Uckermarch in Brandenburg, from Berlin, and from Hall in Saxony.

OBSERVATIONS on the MARBLES, which contain shells, corals, and other extraneous BODIES.

Besides the species of marbles, containing shells, corals, &c. here described; which by some have been called by the general name of *Nephiri*; the following sorts are slightly mentioned by authors.

The *Lumachella di Trapani moderna*, the *Lumachellone antico*, and the *Lumachella castracanata antica*; all Italian marbles.

The *Blumenstein*, i. e. flower-stone, a marble quite composed of a vast heap of all kinds of shells laid so confusedly together that their species cannot be distinguished; the variegations, which these shells form in the marble, sometimes rudely represent flowers, from whence it has obtained its name; it is dug in the bishoprick of Hildesheim in Germany; Bruckman, *Epist. Itin. Cent. II. Ep. 26. p. 246. N°. 29.*

A marble full of shells, both turbinated and bivalve, and other marine bodies, is dug at the village Espertadt, a league from the city of Querfurt, in the duchy of the same name in Saxony; and there are also quarries on der Ruckenberg, near the said city, of a grey marble full of shells, and their sparry casts, which is very hard, and is capable of a fine polish, l. c. *Cent. I. Ep. 25. p. 6. N°. 4 & 5.*

OBSERVATIONS ON MARBLES.

The numberless varieties of the colours of marbles makes it very difficult to ascertain their different species by their colours; the celebrated antient naturalist Pliny, l. xxxvi. c. 7. judiciously observes, that they are as various as the places from whence they are dug, each different quarry seemingly yielding a different species; however as their texture furnishes us with but two characteristics, which is granulated, as the Parian, the Carrara marble, &c. or solid, as most of them are, it is to their colours only we can have recourse to define the many species of them.

Tho' an inextricable confusion seems to attend this arrangement of marbles from their colours, yet a judicious and accurate enquirer will find fixed rules, by which, with requisite attention, the task will not appear so extremely difficult; tho' different blocks of the same kind of marble will on first view appear of very different species, yet in every distinct species, either in respect to the colour, the order or disposition of its variegations in veins, spots, clouds, &c. or in regard to its texture, hardness, polish, or other particulars, there will always be observed some unerring standards to determine the said species.

On

On this principle, which I have followed in my arrangement of marbles, it is easily observed, that all marbles of single or uniform colours, as black, white, &c. I have arranged as different species; and those again I have subdivided into different species of black marbles, white marbles, &c. according to the different particulars or characters which constantly attend them, and which are characters strong enough to determine one species of black, white, &c. marbles from others of the very same colours; and tho' even some of these uniform coloured marbles are found sometimes variegated with other colours, as the yellow marble described number XVI. yet a careful research into the nature, texture, and other particulars of the marble, and obtaining due observations on its strata, &c. will fully inform us that those variegations are not constant to it; neither are they so essential, but that vast masses of it are dug of a pure uniform yellow colour, and without a single speck or vein to variegate them.

I have already observed, that the disposition of the spots, veins, &c. are in some marbles extremely regular and constant, in the same manner as the spots on the porphyry, or those on the serpentine or *ophites antiquorum*, &c. some are never found but veined, others only spotted, sometimes with regular spots, some are lineated, some clouded, and lastly others irregularly variegated with spots, veins, clouds, &c. these characters are very remarkable in numbers of the marbles of only two colours, and examples of such are set forth in the foregoing descriptions; of the marbles variegated with many colours, it is indeed difficult truly to define their species by their colours, but then on consulting their other fixed characters of texture, polish, hardness, &c. we can with some probability define their species.

I have, to make the study of this part of natural history (heretofore very obscure, on account of the irregular method used by authors in describing marbles) clear and easy, and to know what marbles are described or known, used a very regular and simple method; I have arranged them into the four divisions here set forth; of the first, or that of the plain or uniform marbles, the kinds are easily distinguished; the second division contains those marbles which are only of two colours; and in this division, to avoid the confusion which necessarily must attend if a regular method was not used, I have first placed the marbles whose chief or ground colour is black, variegated with the other colours, as black with white, black with ash and grey, black with brown and red, with yellow, with blue and with green, all in their due order; and in this manner I have proceeded with all the other chief colours, *e. g.* white with black, with grey, brown, red, &c. and at the end of each section I have given a list or catalogue of all the marbles of these colours (unknown to me) slightly mentioned by authors, and which seem of different species from those I have described; by this regular arrangement of colours, which I have pursued thro' the whole genus, I have made it easy to my readers to readily find whether a marble has been hitherto (to my knowledge) described or not, or whether there are any which approach it in colour, on only reviewing the single section where those colours are arranged.

Wallerius, in his Mineralogy, and Linnæus, in his *Systema Naturæ*, are extremely confused in regard to this genus of fossils; the former has divided all the marbles into only three species; *viz.* of uniform, variegated, and what he

he calls figured marbles, i. e. such as are like the Florentine slates, and has ranged them all, only as different varieties of these species; the latter have even made them all only varieties of one species; on which I cannot but make this observation, *That it is a pity the learned should apply their studies rather to perplex science, than to elucidate it, and instruct mankind.*

Wallerius remarks, that the *lapides calcarii*, or limestones, and the marbles, are not essentially different genera, and that only for more clearness he has ranged the latter in a particular genus; his observation is extremely just, but as I have made two of the characters of marbles, to be of beautiful colours, and capable of a fine polish, it was unnecessary for me either to make a particular genus of the limestones, or to have ranged them all with the marbles; for all such limestones, (commonly so called) which are of beautiful colours, and are capable of a fine polish, as e. g. the entrochus marble, species LXXVIII. are really genuine marbles; and all others, which are not beautiful of colour, or capable of a polish, are truly to be referred to my genus of saxa, in which examples of such are set forth.

The said author further informs us, that by chemical analysis marbles yield less volatile salt than limestones, but contain more bituminous and sulphureous parts, which contribute to the greater compactness or firmness of their texture; it is that also that gives marbles their glossiness and brightness; these sulphureous and bituminous substances, joined to some metallic exhalations is the cause or origin of the variety of fine colours, which we admire in marbles; One may conjecture, from what has been said (adds the same author) the reason why in places, where there are bituminous substances joined with marine salt, as in Italy, the finest marbles are found.

Of the antique marbles, we have little knowledge at present, more than what the ruins of antient edifices afford us; Pliny is the only one who has left us any account of them, he indeed describes some marbles by particular notes or characters, as the Parian, the Porus, the Chernites, the Coraliticum, the Lucullan, Augustan, Tiberian, &c. but his descriptions are nevertheless so slight that few of them can be now ascertained; the others he only names, without leaving us the least note of them, as the Chium, Numidicum, Carystium, &c. Another particular to be observed, in regard to our little knowledge of the marbles of the antients, is, as the Mus. Richter. (1) judiciously observes, that though we undoubtedly have some of the same species used by them, in these parts of Europe, yet as they had all their marbles chiefly from Africa, and other remote parts of the world, which they conquered, and where they kept troops, or founded colonies, &c. countries which we are now not at all acquainted with, is the reason we cannot confer the marbles used by them from those countries, and which generally obtained the names of the places where they were dug, to fix with certainty, what species they are, or whether known to these times.

(1) Jam recentiorum fere in Italia audeat exercere desueta eorum marmorum nullum est transmarinum, tallia, ubi Scythica Barbaries late omnia quis enim quærat hodie terris illis, obtinet? P. 189.
aut, si quærere curet, inveniatur, vel

S E R I E S II.

C H A P. III. G E N U S II.

Stones, which in their nature, texture, appearance, and other properties resemble marbles; and only differ from them, in that the bodies of this genus never form continued strata, but are only found in loose independent masses lodged in strata of other substances.

D I V I S I O N I. *Marmoroidæ of a plain structure.*I. *Marmoroides albescens nigro eleganter lineatus.*

DE Laet. de gemm. et lapid. l. ii. c. 25. cum icone.

This is a very elegant and curious kind; it is of a greenish white colour, beautifully lineated all over, with equidistant and regular black lines or streaks; it is very hard, and is found, but rarely, in an island commonly called Monte Christo, on the coast of Tuscany.

II. *Marmoroides dendropotamites.*

This is a very pretty variegated marmoroides; its chief colour or ground is an agreeable ash, not uniform or equally diffused, but of different degrees of shades; its other chief colour is a clay or yellowish brown; the ash colour lies generally in the middle of the stone, and is adorned with large deep ashen arbuscular spots, set in streight lines like hedges or rows of trees; these arbuscular delineations are not composed of fine ramified streaks like the common dendritæ; but are a congeries of blotches so laid together, as to resemble trees full of leaves; the yellowish brown colour generally lies at the sides or edges of the stone; so that the whole together does not unaptly represent rude landscapes of rivers, hedges, rows of trees, roads, &c. from which appearance I have so named it. It is capable of a fine smooth surface, and of an extreme good polish, and is a beautiful species.

It is of a very fine, compact, solid, uniform texture, but quite destitute of brightness; is very heavy, moderately hard, will not strike fire with steel, and burns to a pale whitish colour.

This kind is found in some places in the mines on Mendip hills, as also about Bath and Bristol, and some other parts of Somersetshire, but it is not very common: I have seen a block of it, near a foot and a half thick, and two feet over, but the masses of it are generally small.

Dr. Grew, Mus. Reg. Soc. p. 268. & fig. tab. 20. exhibits a stone much resembling this marmoroides, and to which, on the same account, he gives this same name of dendropotamites; but as that learned and accurate author expressly mentions his to be a kind of alabaster, it is not only of a different species, but even of a different genus.

III. *Marmoroides rubescens granulis conflatus sicuti hammites.*

This is a curious tho' not a pretty species; it is generally of a pale dull fleshy reddish colour, with slight streaks or veins of red, and is intirely composed of whitish round granules, like the spawn of fish, all of the same bigness, *i. e.* of poppy seed, firmly and closely cemented together by a pale red cement, which renders the whole stone of that dull fleshy colour; the grains are every where extremely visible, but are so intimately and firmly cemented, that they cannot be loosened or freed from the cement; it generally bears but a middling polish, tho' its surface is very smooth; it is very hard and heavy, and will not strike fire with steel.

This species is found on the sea beaches of some parts of this kingdom, among the other stones which are vulgarly called *pebbles*; I have seen nodules of it from the shores of Yorkshire, and from Aberdaran in Caernarvonshire; but they are not very common, and are generally roundish masses of the size of hens eggs.

Masses of this kind of marmoroides, are also found in some of the rivers of Switzerland; for Scheuchzer, Oryctogr. Helvetica, p. 122. and Mus. Diluv. n. 208. m. exhibits a yellowish red marble, intirely made up of hammitæ, from the canton of Bern; and Ib. p. 335. and in Mus. Diluv. p. 105. * 49 & 50. he also exhibits reddish masses with white granules, and yellowish hammitical masses, which he calls *Silices*, from a rivulet at Aust near Basil; and Woodward, Cat. K. μ 23. exhibits a mass of stone, very hard, so as to take a fine polish; it appears to be part of a nodule or pebble, which was sent to him by the said Dr. Scheuchzer, from Frickthal near the village Terznach in the canton of Switz, with the title of *Marmor hammiticum subflavi coloris*; all which specimens are of this species.

The said Dr. Scheuchzer, in his Lithogr. Helvetica, p. 41. observes, speaking of the hammites, that it is not always friable, but that it is sometimes hard, masses of it being found which appear perfectly like pebbles; and in his Mus. Diluv. l. c. * 48. 51 & 53. and Oryctogr. Helvetica, p. 335. he further exhibits white hammitical marmoroidæ, which he likewise calls *Silices*, from the same rivulet, and from the river Birs; which, whether they are a distinct species from this is uncertain, for they might perhaps be rendered white by the constant washing and insinuation of the water.

A yellow hammitical marmoroides is also exhibited by Bruckman, Epist. Itin. Cent. II. Ep. 26. p. 247. N°. 40. from the town of Massel, in the principality of Oehls in Silesia; he observes that these masses are of the nature of marble, are capable of a fine polish, and that they are frequently found, with varieties of other marmoroidæ, in loose nodules, on the lands in the neighbourhood of that place.

The said author, Ibid. Ep. 72. p. 909. also exhibits a greyish yellow mass with hammitæ of the bigness of millet seeds, and a whitish mass, the granules whereof are so fine, that they are hardly discernible to the naked eye (both which are capable of a fine polish like marble) from the neighbourhood of the castle of Suckow, in the Uckermarch in the electorate of Brandenburg, and

and which in like manner are frequently found loose on the lands, but never forming strata; all which stones may be referred to this species.

IV. *Marmoroides luteus dendritibus nigris pulchre pictus.*

Marmor luteum in cujus superficie, subtilissima fruticeta vulgo dendritæ visuntur. Bruckman, Magnalia Dei in locis Subterr. Vol. I. p. 89. Id. Epist. Itin. Cent. I. Ep. 25. p. 10. N°. 3. Ep. 26. p. 4. Cent. II. Ep. 26. p. 244. N°. 1. & 2. p. 249. N°. 58. p. 250. N°. 82. a 85. p. 251. N°. 86. Ep. 36. p. 361. & Supplem. ad Cent. II. p. 1262. N°. 11.

This marmoroides is of a yellow colour; sometimes of a very light clear yellow, at other times dark and brownish, and near to a cinnamon colour, and is generally finely variegated with black dendritæ; for the black variegations also sometimes form only specks, streaks, &c. these black dendritæ are mostly superficial, for on polishing the stone they gradually grow confused and near disappear. It is of a fine compact, solid, uniform texture, is hard, is generally capable of a very fine surface and polish, and, when the dendritæ remain perfect, is as beautiful as the Florentine dendritical slate.

This kind of dendritical marmoroides is always found in loose masses, and never forms strata; the masses of it lie scattered on the lands like flints near the city of Coburg, the capital of the duchy of the same name in Franconia; also at Streitberg, in the margraviate of Bayreuth; at the village Holtz Engel, in the principality of Schwartzburg; near the city of Goslar; and in some other parts of Germany.

V. *Marmoroides variegatus.*

Meschio Nero Carrarese. Imperat. Hist. Nat. l. xxv. c. 8.

Marmor Carrariense, punctis sanguineis et albis venis distinctum. Bigio Chiaro antico, Gimma, p. 33. Mus. Richter. p. 193.

This marmoroides is variegated with black, white, and yellow spots, but chiefly with black, and often with blood red spots, and greenish white veins; it is capable of a very good polish, burns to a fine white lime, and is found at Carrara in Italy, generally imbedded in a reddish earth.

It is used in Italy, says Imperatus, for the scapi of pillars, and other like works.

VI. *Marmoroides variegatus alter.*

This is a very elegant and beautiful marmoroides; it is finely variegated with bright red, veins and spots of a clear white, large spaces of a sullied white with pale purplish streaks, specks of an opaque yellowish white, and spots of a deep olive green colour; it is capable of a most elegant polish, equal to that of an agate, is of a fine compact, solid, uniform texture, extremely heavy and hard, and will not strike fire with steel.

I have also seen specimens of this kind, whose structure was intirely made up of different crusts so as to appear to have been formed by incrustation; and

originally to have filled some fissure or hollow; where it was thus formed by water in the same manner as the common sparry incrustations are.

I have seen many specimens of this elegant kind of marmoroides, by the name of Sicilian jasper, said to be got near Trapani, and have also been informed it is found in France.

DIVISION II. *Marmoroidæ*, containing shells, corals, and other extraneous bodies.

VII. *Marmoroides niger coralliis refertus*.

This is of a deep black colour, is capable of a smooth surface, and of a very good polish; it is of a fine compact, solid texture, and not quite destitute of brightness, is heavy, hard, does not strike fire with steel, and burns to a white colour.

The coralloids in this marble are lodged in very great numbers, they are as thick as a common packthread, and are all posited in an oblique direction, so oblique, indeed, as to be nearly horizontal to the surfaces of the masses; they lie very thick, but are seldom confused or mixed together, and are parallel to each other; they are cylindric, none ramose, and are now composed of an opaque coarse yellowish whitish spar, which has so saturated them, that they seem all solid, and to have lost their original structure, which, as appears by some few, is sulcated exteriorly their length and interiorly made up of only longitudinal plates from their center to their circumference, for they have no marks of the diaphragms or transverse septa, usual in like coralloids; the marmoroides being black, and the coralloids whitish, and both taking a fine polish, form together a beautiful stone.

This marmoroides is found in loose masses scattered on the surface of the earth, in several parts of Derbyshire, as at Tideswell in the Peak, Fairfield, but more especially at Lathkill Dale; the masses of it are most generally flattish, about three inches thick, and about two feet in circumference.

The coralloid masses exhibited by Dr. Woodward, Cat. A. e. 27, 28, and 29. from between Skegness and Ingoldmells, on the shores of Lincolnshire, from the shores near Scarborough, and from the shores of the river Humber near Paul in Yorkshire, are very probably of this species of marmoroides.

VIII. *Marmoroides nigrescens durus coralliis refertus*.

This is blackish, of a fine strong, solid, compact texture, extremely bright and glittering, and is capable of a good polish; it is heavy and hard, and strikes fire somewhat freely with steel, on the very same places where the marbly matter ferments briskly with aqua fortis, and burns to a pure white lime.

This marble is thick set with streight cylindric coralloids, as thick as common writing quills, and are all lodged parallel to each other, and in a perpendicular position in regard to the surfaces of the masses; they are now saturated with a fine glittering whitish spar, which make them solid; but those coralloids which very commonly protuberate on the exterior parts of the masses, and which generally are free from sparry matter, and perfectly retain their original structure, shew it to be made up of many longitudinal plates,
placed

placed from their center to their circumference, and thickly intercepted by diaphragms or transverse septa; exteriorly they are striated their length, and are incircled with many annular ridges, and sometimes some few of them appear to have been ramose, having vestigia or remains of branches.

This species is found in plenty between Tuam and Galway in Ireland.

IX. *Marmoroides albescens stellatus.*

Astroites marmoreus Tyrolensis. Boccone Recherches et observations naturelles, p. 119. & seq. & ej. Museo di fisica e di esperienze osserv. 45. p. 287.

Lapis stellatus vel stellaris, aut astroites marmoreus candidus, Pietra stellaria marmorata, Urania Sicula, Cup. Hort. Cath. Supplem. Alt. p. 49.

Astroites Siliceus, f. Marmoreus minimis stellis. Scheuchzer's Spec. Lithogr. Helv. p. 39. fig. 53. & desc. p. 36. N°. 49. sub tit. *Astroites majoribus stellis, et Astroites Tyrolensis.* Ej. Mus. Diluv. N°. 141 & 142. & Herb. Diluv. p. 88. N°. 315. and Langius's Hist. Lap. Fig. Helvetiæ, p. 59.

Woodward, Cat. I. x. 7.

Bruckmanni Epistola de fabulosissima origine lapidis *Arachneolithi* dicti.

This is of a whitish colour, of a very fine strong, compact, solid texture, of a marmoreous substance, but quite destitute of brightness; it is very heavy and hard, and will not strike fire with steel; it is thick set throughout the whole body with very small regular stars, somewhat bigger than pins heads, which are finely radiated and made up of longitudinal plates; they are composed of a whiter and more opaque substance than the rest of the stone; these marmoroidæ are capable of a very smooth surface, tho' generally of but a middling polish, and are nowise beautiful or striking to the eye, on account of the uniformity of colour of both the coralloids and the stone.

They are affirmed to be found in great quantities in the Tyrolese; and are generally small round nodules of the size of apricots; they are also found in Sicily, in the Birsz near Basil, and in the other rivers of Switzerland; as likewise in some parts of Germany.

De Boot de Gemm. & Lapid. l. ii. c. 145, 146. mentions that the Tyrolese astroitæ are found of the size of a human head, that author describes several sorts; and Worm. Mus. p. 68. partly copies him, but exhibits no white astroites, or of this species, in his collection.

Bruckman, in his dissertation on this starred stone, wherein he refutes the idle and erroneous notion of its being formed by spiders, and from thence named *arachneolithos*, affirms that the finest stones of this kind are found in the East Indies; the specimen he describes, which is this very species of marmoroides, was from that part of the world; it is of an exquisite polish, and the stars are reddish, which undoubtedly proceeded from some loose earthy or other substance, which had casually filled the tubes; and to the same cause is owing the black stars of the specimen exhibited by Scheuchzer, Mus. Diluv. N°. 248. i. with the title of *Silex marmoreus albus stellulis nigricantibus conspersus ex montibus Bononiensibus*, for it is not a distinct species from this.

X. *Marmoroides*

X. *Marmoroides albesceus corallii refertus.*

This is of a sullied or ashen white colour, heavy, moderately hard, of a fine compact solid texture, and very bright or glittering; it is capable of a smooth surface, and a middling polish, will not strike fire with steel, and suffers little change of colour when burnt.

It is thick set with coralloids far surpassing in quantity, the marmoreous substance; they lie somewhat confused and irregular, tho' they seem to affect a parallel order, and are somewhat obliquely lodged in regard to the surfaces of the masses; they are cylindric bodies, as thick as crows quills, generally strait, and are composed of a whitish spar, are solid and exteriorly smooth, shew no signs of an interior lamellated or stellated structure, and their ends appear on the mass, when polished, only like white roundish spots; it is not a pretty or agreeable stone.

Masses of this species are frequently found near Bangor, in Caernarvonshire.

XI. *Marmoroides columnaris stellatus, Lithostroton dictus.*

Lithostroton, five Basaltis minimus striatus et stellatus. Lhuyd's Lithophilacii Britannici Ichnographia, Epist. V. Tab. 23. Herman's Maslographia, P. II. cap. x. p. 226. Tab. 12. fig. 10. Kundm. Promt. p. 214. N^o. 73. Woodward Cat. C. b. 86. a. b. 107.

Corallium Arachnion, Astroites arachnoides, f. Telis quasi araneis obtextus, pentagonus, Astroites vorticalis. Volkman's Silesia Subterr. c. 4. § 47. p. 120. Tab. 18. fig. 5.

Marmor rude particulis impalpabilibus cinereis striatis et undulatis. Gronovius's Ind. Supell. Lapid. p. 5. N^o. 1.

This marmoroides is of a grey or an ashen colour, not always equally diffused, and is generally tinged reddish in some parts; it is of a fine compact, uniform texture, very bright and glittering, is capable of a most elegant polish and surface, is heavy and moderately hard, will not strike fire with steel, and burns to a pure white lime.

The masses of this stone are a congeries of many angular coralloid columns, now quite marmoreous, all closely concreted together, and placed in a parallel direction; they generally lie quite perpendicular, but sometimes are placed in such manner, that they point and verge towards a center; they are of different lengths, according to the bigness of the marmoroidæ, for the columns always pervade the masses be they never so large; the longest columns, Dr. Woodward observed, were thirteen inches in length; as to the diameter of the columns, the largest the said author saw, which agrees with all I have seen, was not half an inch in diameter, and the least, near a quarter of an inch; they being generally pretty nearly of the same thickness; indeed, the sides being unequal, the same column is frequently of a greater diameter measured one way than another; the columns are also different in regard to the number of their sides, some having seven, others six, five, four, and even some few are found near round or cylindric, but the most general are pentagonal columns, tho' all these varieties

varieties are often found concreted near to each other, or in the same mass; these pillars distinctly appear on the sides of the masses, which, if not too violently struck, always break in a columnar manner; the sides of the pillars are finely and thickly striated their length, and are transversely ridged; its interior structure is made up of longitudinal plates, set in a stellated manner, from the axis to the circumference, which are intercepted by numerous diaphragms or transverse septa, and when the apices or tops of the columns happen to be complete, they are hollowed or concave, and a prominent star, one third of the dimensions of the concave, rises out of the axis of the apex; when polished all these angular columns shew themselves on the surface, in a fine net-work of heptagonal, hexagonal, pentagonal, &c. meshes, and each mesh is adorned with a fine radiated star in it; and what with the beauty of the net-work and stars, and the exquisite polish and fine surface it is capable of, it is as elegant a stone as any of the fossil kingdom.

As these columns are only the marmoreous casts of marine coralloids, buried in the earth, they are sometimes also found inflected or bent, crackt, broken, and imperfect, in the same manner as other marine bodies now fossil are found.

Dr. Woodward informs us, the *lithostrotion* is all found on the tops of the rocky cliffs about two miles from Tenby, towards Milford in Pembroke-shire, in Wales; it is found in masses of different sizes, often about a foot thick, immersed in a grey sparry limestone; it lies in several postures, but chiefly erect, or a little inclining, but never horizontal.

Masses of it are likewise found in rivers, and on the surface of the earth, in several other parts of Wales, in Lancashire, Cheshire, Yorkshire, and other parts of the kingdom.

It is also sometimes found in Scotland, in Silesia, and some other parts of Germany.

Masses of this stone are often found, of a whitish colour, but as that colour might proceed from insinuation of water, or other like particular accidents, those whitish masses are to be counted varieties of this stone, rather than a distinct species of it.

XII. *Marmoroides cinereus coralliis refertus.*

Woodward, Cat E. k. 17.

This is of an ashen colour, dense, about the hardness of the white Genoese marble, and is capable of a good polish; it has in it great numbers of ramose coralloid pori, of a sparry constitution; they are composed of plates running longways of the body, and passing from the surface to the axis of it, and is also set pretty close with transverse septa, or diaphragms, which intercept the foregoing; these bodies exteriorly are thick-set with annular ridges, and terminate in points.

Dr. Woodward received this kind from off the brow of Scatter-Scar-Gill, in Arkendale, Yorkshire; there is a considerable quantity of the same stone, with like bodies in it, and often with several shells, in the same part of the hill.

The

The coralloid mass from near Rorey, betwixt Cockermouth and Egremont, in Cumberland, exhibited by the same author, Cat. C. b. 138. is of this kind of marmoroides.

XIII. *Marmoroides fusco-cinereus coralliis refertus.*

This is of a dull brownish grey colour, of a firm solid texture, and of some brightness, heavy, and moderately hard; it is capable of a smooth surface, and good polish, will not strike fire with steel, and burns white; it is thick set with streight cylindric coralloids, lying parallel to each other, and perpendicular in regard to the surfaces of the masses; they are composed of whitish spar, are of the thickness of a goose quill, and their structure as common is made up of longitudinal plates disposed from the center to the circumference, and intercepted by numerous transverse septa.

It is a pretty marmoroides; there is a vein of it, about thirty feet from the surface, and beneath the stone, in a limestone quarry, on the hill called Kyrne y bwch, near Oswestry in Shropshire, and is polished and used in those parts for tables, and other ornamental works, and masses of it are also not unfrequently found in several parts of the kingdom.

This kind is the *marmor junceum* or *junci lapidei* of Dr. Woodward, Cat. A. e. 22. * & e. 22. †. who observes, that the stone off which his specimen was broke, tho' itself only a fragment, was near two feet long, and the cylinders extended through it for that whole length; it was taken out of a quarry betwixt Carlisle and Cockermouth in Cumberland; the common stone of the quarry is much different, and this is found only in spots, but, as he was informed, placed there in such a manner, that the cylinders stood erect, and the specimens, e. 24. & 25. of the said author, Ibid. from the shores near Sunderland, in the bishoprick of Durham, and the shores near Outhorne in Yorkshire, are also of this species.

XIV. *Marmoroides nigro-fuscus conchyliis refertus.*

This marmoroides is of a dark brown colour, near black; it is moderately hard and heavy, is of a very fine compact, solid texture, and extremely bright and glittering; it is capable of an elegant polish, and smooth surface, and will not strike fire with steel.

It is thick set with whitish shells and casts of a very fine bright opaque white spar, in the room of the shells, which are decayed and washed; the shells are generally thick, about the size of common muscle shells, are laid flat, and are a species of Tellina; they take an equal polish with the marble, which being a dark brown, and the shells white, form together a most elegant marmoroides.

Masses of this kind are found in some parts of Derbyshire, especially near Wingerworth, the seat of the Hunlock Baronet family. Dr. Woodward, Cat. D. g. 8. exhibits it also from a quarry near Clay Cross, in the parish of North Wingfield, in Scarfsdale, Derbyshire; and in his Cat. B. p. 48. he again exhibits this same marmoroides from a coal-pit at Adderton in Yorkshire, and informs us, that the colliers say it lies four fathom deep just over the coal.

XV. *Marmoroides*

XV. *Marmoroides fusco-flavus stellatus*, f. *Astroites fusco flavus*.

This is of a dull brownish fleshy yellow colour, of a fine glittering, compact, uniform texture, not heavy, moderately hard, will not strike fire with steel, and burns to a pale white colour.

This kind is thick set with large stars, which generally are of the size of silver pennies; they are not tubes, but are composed of naked or loose thick longitudinal plates, which are disposed from their center to their circumference; these plates or rays are not equally produced from the centre of the stars, but are of very different lengths, nor are they regularly disposed in regard to the stellar radiations, for often two rays join at the centre, and bifurcate at the extremities; the number of rays or plates to each star or coralloid body, is also very differing, some having twelve, others thirteen, and others of all the intermediate numbers to twenty, but none have less than twelve rays or plates, and they have no transverse septa or diaphragms intersecting these longitudinal plates; they all lie parallel to each other, and are lodged quite perpendicularly in regard to the surfaces of the mass; they are of a pale yellowish colour, and are composed of a coarse glittering opaque spar; the whole mass is capable of a good surface, tho' but of a middling polish, and, notwithstanding the curious appearance of the stars, which are large and fine, yet on account of its dulness of colour and indifferent polish, it is not a very beautiful stone.

It is found in the island of Sardinia; as also in some parts of Switzerland.

OBSERVATIONS on the MARMOROIDÆ.

Besides the species of marmoroidæ here described; the following sorts are slightly mentioned by authors.

A very fine red or flesh coloured marmoroides, with white and dark grey spots and veins, is dug in large masses in the district of Thierbach, in the Margraviate of Bayreuth. Bruckman, Epist. Itin. Cent. I. Ep. 24. p. 5. N^o. 19.

A very fine and beautiful marmoroides, of a whitish yellow colour, set with curious white spots like bundles of feathers or bunches of pinks, and is capable of a fine polish, is sometimes dug in the limestone quarries between Leutendorff and Redwitz, in the same margraviate; Id. l. c. p. 3. N^o. 2. & Magn. Dei in loc. Subterr. Vol. II. p. 166.

Elegant marmoroidæ, generally of a grey colour, and very hard, with fine white sparry *cornua Ammonis* in them, are not unfrequently found on the lands round the city of Altdorf; Ib. l. c. Ep. 25. p. 5.

Marmoroidæ filled with shells of various kinds, and trochitæ, are found in the clay pits of a spot of ground called Osterfeld near Goslar; Ib. Cent. II. Ep. 26. p. 254. N^o. 182.

It were endless to enumerate the many other sorts mentioned by authors to be found in different parts; it is sufficient to observe, that the sea beaches of

most of our coasts abound not only with extreme beautiful marmoroidæ, but also with masses of granates and porphyries, and with jaspers, agates, &c. which are all confounded under the common and vulgar name of *pebbles* from their being generally round; the French likewise confound all these stones found on the sea shores by the one common name of *Galets*; and the Germans, who have also (tho' an inland country) great quantities of them in different parts, (as *e. g.* (1) at Maffel in Silesia; (2) at Havelberg, (3) at Suckow, in the Ucker-march, in the margraviate of Brandenburg; (4) in the river Sil, in the canton of Zurich in Switzerland; &c.) call them by the general name of *feld steinen*, i. e. field stones, (their authors by that of *lapides* or *silices marmorei*) a name common to all stony nodules.

The celebrated Dr. Woodward (5) who calls all the loose independent masses of stone by the names of *rubble*, *copple*, or *boulder stones*, and many other lithographists, think that these said masses are only fragments, which at the general deluge, or by other accidents, were broken off from their original strata, borne thence, and worn and rounded by the force of the waters, into the form of nodules, and lodged in other strata; since which, by the insults of the sea, those found on the shores have been beat out of the adjacent cliffs: it is undeniable, that most part of these masses of marbles, granites, &c. are evidently only such fragments, since great strata of the like sort are found in many countries, and of which it might reasonably be concluded, that they were originally fragments, tho' now found lodged at such great distances from their beds; but tho' this system is probable in the general, yet certainly, on due consideration, it cannot be allowed to be the origin of all these loose masses found scattered every where.

It is on this account, as one of my characteristics of marbles is, that they are found forming strata, (to avoid exceptions, the too common error of writers of natural history, and which always causes confusion in their methods) I chose to form this new genus of marmoroidæ, that is, of such stones of a marbly nature, which are never found but in loose masses, and which we may reasonably affirm never form strata, if we well consider their situation in the earth, and other particulars of their natural history; *e. g.* such positively are the *lithostrotion*, the *astroitæ*, &c. described species 9, 11, 15. and of which certainly no idea can form whole strata ever to have existed; the observation that all marbles do not form strata, is indeed very antient (6), and if even by future

(1) Hermannii Maslographia, P. II. cap. 6, 7, 8. et seq. et ejusd. Monumentum gratitudinis marmoreum de conchitibus marmoreis Massensibus, 4^{to}, cum fig.

(2) Bruckmanni Obs. in den Hamburgischen Berichten von gelehrten sachen, An. 1743. p. 610. &c. & An. 1747. p. 620.

(3) Bruckman, Epist. Itin. Cent. II. Ep. 72. p. 902. & seq.

(4) Scheuchzer, Oryctogr. Helvetica, p. 129.

(5) Rotulæ lapideæ et globuli lapidei. Method of fossils, p. 12. N^o. 42. & 43. & Cat. A. page 19, 22 & 23.

(6) Plin. Hist. Nat. l. xxxvi. c. 7. Marmora—non omnia tamen in lapidinis gignuntur, sed multa et sub terra sparsa.

discoveries strata of some of those kinds I now rank as marmoroidæ, should be found, for such may be, it is very easy to remove the error without the least disorder in the method, by placing them in the genus of marbles to which they belong.

I have with great care avoided ranging any one stone as a marmoroides, of which sort I have known a marble, or even a like marble to be mentioned, though ever so slightly, by any author, altho' the said loose masses are only found in the most remote countries from where the strata of the same marble are discovered, since with probability they might be concluded as fragments of such strata, either broken off by the violent effects of the universal deluge, or by other great changes the earth has undergone.

S E R I E S II.

C H A P. IV.

Stones found forming continued strata, bright and beautiful, of very lively colours, and of a constitution so fine, that they will take a good polish; in all which particulars, they agree with the genus of marbles, but differ from them in that they are never calcareous, nor do they ferment with acids: such are the *Marmaro-prosera*, the *Granites*, and the *Porphyries*.

G E N U S I. *Marmaro-prosera*, *f. marmoribus adfinia*.

Stones of a compact, uniform texture, like that of marbles; some of this genus are vitrifiable, others not; and some only are of such hardness, as to strike fire with steel.

I. *Marmaro-proseron nigrum columnare polygonum et geniculatum*.

L A P I S Basaltes vel Basanos maximus Hibernicus angulis minimum tribus, plurimum octo constans; crebris articulis sibi invicem affabre conjunctis, sed facile separabilibus, geniculatus, D. Molyneux Phil. Transf. N°. 212. also N°. 199. 235. & 241. and Lowthorp's Abridg. Phil. Transf. Vol. II. p. 511. Phil. Transf. N°. 485. p. 124. and Vol. 48. P. I. p. 226. with two maps, Tab. XI. p. 238. and likewise the east and west prospects of the country and Giants causeway, in two elegant folio prints engraved by Vivares from the original paintings of Mrs. Susannah Drury, which obtained the premium given by the honourable the Dublin society for the encouragement of arts and sciences in the year 1740.

This species of stone, which naturally grows in polygon columns made up of joints or pieces laid on each other, and contiguous, but not cohering together, is of a good deep black colour; it is capable of a very smooth surface, and of a good glossy polish; its texture is fine, very strong, compact and uniform, and not destitute of brightness; it is extremely heavy, and of a very great hardness, and strikes fire freely with steel; burnt for an hour, it suffers no other change than only to acquire a ferruginous hue, but in a violent fire it vitrifies; and Dr. Pococke informs us, that it melted with kelp in a glass house, so as to make the black glass bottles.

It is an excellent touchstone for metals, but being a stone naturally divided into small pieces, or joints, and of such great hardness that it turns or breaks the edges of the best tools, when they offer to cut it, it seems unfit for the embellishing of houses, and all other greater uses of architecture and statuary.

This curious and extraordinary species of stone has as yet been discovered only in one place of the known globe, that is, in the county of Antrim, in the north of the kingdom of Ireland, where that stupendous and amazing production of nature, called the Giants causeway, consists of an assemblage of several thousand columns of this stone.

This

This natural pavement lies about eight English miles north east from the town of Coleraine; it is somewhat of a triangular shape; from the south to a gap of the east angle, is one hundred and thirty five yards; from that to the end of the north point, two hundred and twenty yards; at this part it irregularly narrows to a point towards Scotland, and gently slopes into the sea, and the tide here flows over sixty yards of it, and falls down in little cascades; from thence back to the end of the south point is three hundred yards; the sea beating in, divides this side into three parts or points.

The sea cliffs are very high thereabouts, and what is properly called the causeway is a low head, extending from the foot of the cliffs into the sea, like a mole, in which upon a descent it gradually loses itself; but how far this wonderful work of nature runs into the sea no man can tell.

On the land side this stone is also found in many parts for several miles round; Dr. Pococke informs us, that as he went from Bally-castle, which is about ten miles to the east of the causeway, at two miles to the west of the said place, within less than a mile of Ballintoy, half a mile to the south of the sea cliffs, and about a quarter of a mile to the south of the road, he saw the same kind of pillars in a low hill, he observed both hexagons and pentagons. The rocks towards the sea appeared as if they were formed in the same manner; but when he came to them, he found it was only common rock in several strata, and perpendicular joints; two miles farther, at a peninsula called Donseverik, he saw some tendency in the rock towards this work of nature; and going about half a mile farther, he came to the beginning of the pillars in the sea cliff, as he believes, about five miles from the causeway; and the shore and cliffs being shaped mostly in little semicircular bays, he had many very beautiful views of the upper and middle strata of pillars; in one, particularly, they had much the appearance of ruined portico's one over the other; it continues on the cliffs for about a quarter of a mile beyond the Giants causeway; he saw it again in the road to Coleraine, five miles to the west of the causeway, in a low hill, a furlong to the south of the road, and two miles to the south of the sea; the pillars here are small; and he saw others near two miles farther, to the south of the road, in a low hill, within two miles of Coleraine; so that the whole extends for about eleven Irish or fourteen English miles.

Beyond Coleraine, to the east of Magilligan, he saw the stones in the rocks towards the sea cliffs, and the stones in the hill very regular, appearing at a distance much like the pillars of the causeway; this is six computed miles beyond Coleraine, and consequently about ten English miles from the last pillars.

At Fairhead also, a high point of land, three miles to the east of Ballycastle, towards the top of it, the rock appears as in grand pillars; they say it is not in joints, but it has something of the appearance of a grand gothic piece of workmanship.

Beyond the hill eastward, at several distances, stand many sets of strait and upright columns, ranged in curious order, along the sides of the hills; that parcel of them which is most conspicuous, and is about three hundred yards, or a quarter of a mile from the causeway, in a cliff to the south east, and a third part of the way up the cliff, the country people call the *looms* or *organs*; it is a range of sixty pillars, part of some are fallen, which discovers more behind; the

the tallest is about forty feet high. Dr. Pococke found them to be hexagonal, and larger pillars than most of the others, being about two feet in diameter, and he measured five sides of one of them, which were of 13, 15, 12, 21, and 16 inches respectively, the joints he could come at were about nine inches thick, and each pillar, as well as he could count, consisted of between forty or fifty of them; these joints are almost flat and plain, the convexities on their upper faces being so small as to be scarce discernible.

The said learned gentleman also gives us the following account of the appearance of the cliffs themselves, which to him seemed as surprizing as any other part of this extraordinary curiosity; these, and their several strata, he examined from the rocks on the other side of a little bay, about half a mile to the east of the causeway; he thence observed, that there runs all the way, a *stratum* from the bottom of black stone, to the height, as well as he could conjecture, of about sixty feet, divided perpendicularly at unequal distances, by stripes of a reddish stone, looking like cement, and about four or five inches in thickness. Upon this there is another *stratum* of the same black stone divided from it by a *stratum* five inches thick of the red; over this another *stratum* of stone, ten feet thick, divided in the same manner; than a *stratum* of the red stone twenty feet deep, and above that a *stratum* of upright pillars; above these pillars lies another *stratum* of black stone, twenty feet high; and above this is again another *stratum* of upright pillars rising in some places to the top of the cliffs, in others not so high, and in others again above it, where they are called the chimneys; these chimneys, Mrs. Drury informs us, are about five hundred yards from the causeway, and are four pillars, which stand on the top of the farthest point, a little separated from others, which stick to the rock, and the tallest of them has fifteen joints.

This face of the cliffs (continues the doctor) reaches for two computed miles east, from the causeway, that is about three measured English miles, to the house of Mr. Stewart, two miles west of Balintoy; the upper pillars seem to end over the causeway, and, if I mistake not, become shorter and shorter as one goes from it, lying between two binds of stone, like seams of coal; these binds probably meet together all round, and inclose this extraordinary work of nature; and if so, the pillars must be very short towards the extremities.

He was led to this conjecture, by the following observations; the lower *stratum* of pillars is that which goes by a descent into the sea, and which makes what is called the Giants causeway; and where this descent approaches the sea, it seems probable that the pillars become shorter and shorter, so as to end not much further off; now the upper bind of this *stratum* may have been of so soft a nature, as by degrees, in process of time, to have been washed away by the sea; and in the cliff over the causeway he saw several pillars lying along in a rude manner, almost horizontally, which seemed to him to be some of the pillars of the upper *stratum* falling down by the giving way of the bind, which was under them, and over the lower ones that compose the causeway; and here, most probably, the upper pillars ended, as they are seen no farther in the cliff. He saw the tops of pillars even with the shore, both on the east and west sides of the causeway, and some much lower than the causeway itself; and it is probable that these are much shorter than those of the causeway,

causeway, which he measured above thirty feet higher than the tops of them.

The Giants causeway, properly so called, consists of many thousand angular pillars (of about thirty thousand of different sizes, according to Mrs. Drury) which stand most of them perpendicular to the plain of the horizon, and very close to one another; for tho' these pillars are of all angular shapes, from three sides to nine, yet the contexture of them are so adapted, and they adjust their sides in such a manner to the next immediate adjoining columns, that there remains no vacuity between them; the inequality of the numbers of the sides of the pillars, being in a very surprising and wonderful manner, throughout the whole causeway, compensated by the inequality of the breadths and angles of those sides (for the several sides of one and the same pillar are commonly of very unequal breadths) so that tho' the pillars are of such various figures, yet all sorts of interstices of what shape soever, are entirely filled up by one or other of them, and the whole looks very regular. Some of these pillars are taller and higher than the rest, others are short and broken, some for a pretty large space of an equal height, so that their tops form an even plain surface; several of them are imperfect, crack'd, and irregular, and others are entire, uniform and handsome; at the south end, which is buried under earth, stones and fragments of rock, the pillars lean a little to the south east, are crack'd every way, and almost lose their shape near the water. Whether these pillars penetrate or grow deep in the earth, is unknown; but Dr. Molyneux informs us, that a gentleman of his acquaintance traced one of the tallest pillars of the causeway, by digging into the strand, and it continued still of the same make and figure, and jointed as it was above, for the depth of eight feet together, and he found no reason to doubt, but he might have traced it much farther.

The pillars are exteriorly smooth, without any rays, furrows, striæ, or any manner of lines, &c. on their superficies; they are of different heights, some so small as to be only between three and four feet, but there are of all heights to above 36 feet (the tallest of the *organs*, as before observed, is about forty feet high) and they consist most commonly of about forty joints; their diameter is from fifteen to twenty six, but generally about twenty inches, and every single pillar retains its own thickness, and angles and sides from top to bottom; they are of all angular shapes from three sides to nine; but those of three, four, eight, and nine sides, are very scarce; there are but about half a dozen pillars of four and eight sides in the causeway, and a few of three and nine sides up in the country; the heptagons are much scarcer than the others, and the pentagons exceed in quantity the hexagonal columns; that side which joins the side of another pillar, is of the same breadth with it, tho' two sides of the same pillar rarely are, each pillar having as many others joined close round it as it hath sides, except the outermost ones, which shew one, two, or three faces open to view; so that when one walks upon the sand, below or under the causeway, the sides of it have their faces all in angles. No two pillars have all their sides of the same breadth with each other, or in the same, or any certain order round them, one has one side 8 inches, the next side 17, then 13, 18, 14, another 10, 9, 13, 11, 4, 12, another 8, 13, 11, 13, 12, 14, another 14, 13, 13, 9, 12, 8, 12, fractions of an inch omitted.

No

No pillar consists of one intire stone, but is made up of several joints or stones, lying as close upon one another as it is possible for one stone to lie upon another, not joining with flat surfaces; for when you force one off the other, one of them is always concave in the middle, the other convex; some of these joints are in the middle so convex, as for those prominencies to be nearly quarters of spheres, round each of which is a ledge, upon which the stones above them have rested, every stone being concave on the under side, and fitting in the exactest manner, upon that which lies next below it; most joints separate very easily, but some, which are more strongly indented into each other, cohere strongly enough to bear the being taken away in pairs; the joints are from six to thirteen, but commonly about eight inches deep; but some pillars for two or three feet seem one stone, and there is a pillar in the causeway of twelve feet, having but one division; and Dr. Foley mentions to have observed joints of eighteen inches and two feet deep; scarce any two joints or stones in the same pillar, have the same depth, or are in any certain order down, or in any two pillars alike; one has the upper joint 8 inches deep, the next under it 6, the third 9, another 11, 12, 9, 7, 8, 6, 7, another 7, 8, 6, 10, measuring from the crevice or line that severs them, which is small as a thread, when they begin to separate. The stones of different pillars do not at all range even one with another; commonly if the top of the stone in a pillar is found either concave or convex, the top likewise of every stone of that pillar is either concave or convex in the same manner, for there are pillars in the causeway of both kinds, *i. e.* with the convex ends of the stones or joints all upwards, and in others all downwards; but some few have also in them a double convex, the hollow end of the stone above and below, being turned to it; and other pillars, also few in number, a double concave, the swelled end of the stone both above and below, turned to fit in it; some few have both sorts, and some also join by near a flat surface, the utmost top of such of the pillars, says Dr. Molyneux, that seem compleat and entire, always terminates with the joint that is flat on the upper side, and no way either concave or convex like all the rest below it; but according to Mrs. Drury, of those joints which seem to have been the original tops, both the hollow and swelling sink or rise uniformly from the very points of the angles, some not above an inch high in the middle; when the joints of a pillar are forced asunder, either the top of the under stone, or the bottom of the upper one, by which it was joined to the other, has a convexity rising two or three inches high in the middle, terminated in a circle from fifteen to twenty three, but generally about twenty inches diameter, which is within an inch or two of the angular circumference; the other stone has a circular cavity, exactly fitted to receive it, so as to touch every where, and have each superficies (which are very smooth) in the articulations adapt themselves on all sides so exactly one to the other as it is possible for two bodies, that are only contiguous, and not cohering; for the most general formation is this, that if a joint be concave at one end, the other end is convex.

It is observable, says Dr. Molyneux, that commonly the joints as well of the inland pillars, as those of the causeway, as they have their situation nigher the earth are longer and taller than those towards the top of the column, but no difference is observed in the cavities or rising of the joints, as they are placed higher

higher or lower in the same pillar, for they continue much the same, as to their depth or protuberance from top to bottom.

Dr. Molyneux further observes, 1. That some of the inland pillars are of a much larger size than any in the causeway, being two feet and a half in diameter; 2. That there are only found among these, such as have three, four, five, and six sides, and none that have seven and eight, like some of the Giants causeway; 3. That the joints of these do not observe that kind of articulation, by cavities and convexities, as those of the causeway do; but their upper and lower surfaces touch only in planes, and they stand united by means of their weight and pressure; so that a small force will sever them; indeed (as above mentioned) some joints of the causeway also actually want the cavity and rising, and are only united to one another by superficies touching close in planes that run a little slanting, and not parallel to the horizon, but this may be a chance formation, since the universal jointing of the whole causeway is certainly otherwise.

The pillars, says Dr. Pococke, are frequently encompassed with as many stones as there are sides: but many of them have a narrow side, which has no stone to it, but is filled up with a piece or pieces of stone, that shall be further explained, which pieces, when the stones are moved, commonly separate, and break off; some stones have two, or three, or more of these sides; so that it is possible a stone that has any number of stones round it, may have double the number of sides: tho' he saw none that he had reason to think were of this kind, except some that had probably only three stones round them, being hexagons, with three broad sides, and three very narrow sides.

Whatever the outward figure of the stone is, (continues the Doctor) the concavity or convexity is either circular, or part of a circle; consequently, as the sides of the pillars are plain, the part between the inside circle and the outward figure must either be filled up (as it is seen) by stone, which sometimes separates, as mentioned above, and as will be further explained; or by the matter pressed up from the sides, as will be more plainly described. In the former case, when the end is convex, this stone often comes off all round at the joint, and leaves the convex end as part of a sphere, and the concave as a mould fitting to it.

I have some stones exactly like a hexagon cut in two, which might be part of a hexagon pillar split; for sometimes a whole pillar appears as split all the way down; of which there is a remarkable one at the causeway.

The Doctor proceeds further, and strives to assign some satisfactory causes in relation to the joints in the pillars, which work of nature seems to be different from any thing yet known; he supposes, for the following reasons, that the several parts of these pillars were at first formed either in the shape of a cylinder, with the upper end in a spherical figure, if not both ends; or that they were either spherical or oblate spheroids, for it is probable, that, when the stoney matter was in a fluid state, and when the stratum of rock was formed, on which it was made, the fluid contiguous to the rock still continued in motion; that, after a time, some of the particles of matter, which compose these pillars, being disengaged from the particles of water, ceased to move, and formed the parts of these pillars, which are next to the rock, in cylindrical or spherical bodies; so much being formed only at once, or in a very short time, as extends

to the first joint; that then other precipitations of the stoney matter in like manner subsided at different times, till the intire pillars were formed; and the top of the last formed being convex, that, which was formed upon it, would probably be concave, and fit to it, either by its gravity, or by being softer.

All being as yet in some one or other of these figures, we suppose the gravitation of the second stratum above the first joint to operate in such a manner on that which was first formed, and still soft, as to press it down; and so eight stones being round one stone, would naturally press down the middle stone into an octagon.

The reasons for concluding, that they were at first in some of these figures, are these,

That the concavity or convexity are either in an intire circle, or part of a circle.

That sometimes the ends of the stones appear to be of a spherical form, for some space down, all round the stone; filled up only by a matter that separates from it, as shall be further explained.

For it is to be observed, that the pillar is not always so pressed out, as in each stone to form a regular multangular figure; but sometimes there is a narrow side, against which there is no stone, as observed before; sometimes it is pressed out only in part; and this, together with the spherical part, is filled up probably at first with the floating matter; which, I suppose, when the other stone was formed upon it, so united with it, that it remains as a part of the other stone, and breaks off from it, when they are moved: and if this happened to the lower part of the upper stone, this matter, which fills up, might unite with the lower stone; for sometimes this narrow side is seen in the same stone, both above and below, the angle being formed in the middle of the stone; and then it is filled up with the matter, which united with the stone above and the stone below.

It is to be observed, in pursuance of the proof, that the stones were originally round and spherical at the ends; that when the pressure was not sufficient to make out the angles, which I suppose to be the cause of these narrow sides, it is in this case plainly seen, that the original circular shape of the stone is still retained; that side not being horizontally in a strait line, but appearing plainly to be part of a circle.

It appears also, that what has been pressed out beyond the circle at the ends, is commonly flat, and not concave and convex; as it was probably made, not by the pressure at the ends, on the spherical part, but by the pressure on the sides contiguous to it; and when part of the circle is taken off, in that case it is probable that the pressure on the sides was very great.

In one stone, the matter, which only in part formed the angle, force being applied to it, came off, and left that part spherical, being one of those stones in which one part of the same end is flat and the other convex, swelling like a cushion.

This stone I sent as a single stone; it is a large octagon, twenty three inches over; but after it had been some time in my garden I perceived a crack in it, and, applying force, it divided. The under stone had been so unequally pressed, that it is not only very thin on one side, but there is a large hole in it,
about

about seven inches diameter, very near the edge of the stone; so that the matter must have been pressed away to the other side of the stone, not equally concave, and the stone above it must have pressed into the stone below this; in which lower stone, the convex part, which pressed through the middle stone, must have been left, as it is broken; which I did not observe at the Causeway.

Some stones at the same end are partly concave and partly convex, probably occasioned by such an unequal pressure; so that I have one which measures nine inches deep on one side, which is convex, and four and a half on the other, which is concave; another, tho' all convex, yet is six inches clear at one angle, and only four at the opposite angle; so that in these stones the joint appears as indented.

We are to suppose, that, generally, the top of the lower stones is convex, and the bottom, consequently, of the stone that lies upon it, concave; but as sometimes both ends of a stone are concave, we must suppose, either that the lower part of the stone, which settled on it, was harder, or, being of an equal hardness, by its gravitation pressed it down.

It seems probable, therefore, that all the ends were originally spherical; some of the stones, it may be, exact spheres; others oblate spheroids, and some longer stones in a cylindrical form, and of a spherical figure at each end. to which conjecture I have been led, by observing the shape of some I have, and of two models of two stones made by Mr. Drury; one of these is convex at both ends; and I have some in the same shape. This spherical figure has been altered by the pressure, in the manner I have observed; for, in the other model, part of the spherical figure is seen round the sides towards the concave end; and I have one exactly of the same kind. In those also which I have, that are at the same time partly convex, and partly concave, the convex part seems to have been the natural figure of the stone, as before described; for, where both ends are concave, that which was probably pressed by a harder stone formed before it, is perfectly concave; whereas that concavity which is made by a stone probably formed after it, is not so perfectly concave as the other; but it commonly remains convex in some part, as observed before, swelling out like a cushion pressed by any weight.

Sometimes a joint near perpendicular begins as in a point from the side, and extends into that stone, and into all the stones of the pillar which are beneath it, so as (when it has run the length of one stone) to take off either two sides of the stones or pillar, or one side, and part of two sides. This indeed sometimes happens to be in the middle of the pillar, and in the same manner all the way down, so as to form two distinct pillars. Thus I have some, which, by this means, have a side less at one end, than at the other; and I have one, in which the spherical part takes off at one end, two sides of the multangular figure, and makes part of a circle; as in some it takes off all the sides at one end, or, more properly, the stone remains in its original spherical figure; the pieces, which fill up where the stone is not pressed into a multangular figure, sometimes do not break off.

As an illustration to the description of this stupendous and admirable work of nature, I have thought it requisite to add the following icons of some of its chief particulars, which icons are taken from Dr. Pococke's account in the

Phil. Transf. Vol. XLVIII. P. I. and from Mrs. Drury's prospects of the Causeway, viz. the first seven figures from the former author, and the other figures from the latter.

Tab. I. Fig. 1. a plan of a pillar, with the measures of the length of the sides, A, B, C, D.

Fig. 2. A plan of a pillar, with the lengths of the other four sides; viz. E, F, G, H, and the distances of the circle from the sides of the polygon.

Fig. 3. A profile of the stones, shewing the sides A, B, C, D.

Fig. 4. A profile, shewing the sides E, F, G, H; the black lines shew the deviation of the circles from a plane; and the large prick'd waved lines shew the profile of the swelling and concavity within them. The upper row of figures in each stone shews the heights of the sides at the angles, so far as they are strait; the under row of figures shews the remainder of the height of the stone, at that angle; or it is the height of the angular curved pieces, which, before they fell off, were the complements filling up the prism, and making the sides of the pillar wholly flat, and the edges or angles of the pillar all strait lines.

Fig. 5. Two upper stones of a pillar, as they stood on the Causeway, shewing four sides of the pillar. Diameter of the upper circle of the upper stone twenty two inches; the circle is about half an inch within the polygon at the side D, but is cut off by the side C, about three quarters of an inch; the sides B and b a little broken.

Fig. 6. The two stones turned together upside down; shewing the other four sides of the pillar. Diameter of the (now) uppermost circle about twenty one inches; the side H much broken, angle f, rounded off from the circle to the (now) lower end of the stone; angle G, is not rounded off.

Fig. 7. The two stones separated a little to shew the bottom of the upper stone, and top of the under one. Diameter of the circles, which meet, twenty two inches. The convex part of the bottom of the upper stone, fitting the concave part of the top of the under one; and the concave part of the bottom of the upper stone, fitting the convex part of the top of the under stone.

These seven figures are drawn by a scale of a twentieth to an inch.

Fig. 8. A part or space of the Giants causeway, taken from Mrs. Drury's west prospect of it, shewing a groupe of columns, and their manner of growth &c. At l, is a pillar having some stones tied together by supplemental pieces.

Fig. 9. Another view, which is a space from a gap at the east angle for 40 yards, composed of very tall pillars, about thirty three feet high and two broad, none on this side are above an inch or two narrower; taken from Mrs. Drury's east prospect of the Giants causeway. The stones which compose some pillars, have all the space on their ends, that is between the circle and the outside, flat; and as the circle is always farthest from the narrowest side of the polygon, the flat is broadest there; where the circle touches the side, it divides the flat into little triangles; when such are joined the mark of separation is a strait line, on every face of the pillar; many stones have from one or more of these flat triangles, as a base, a solid angle continued up, and hollow'd away smoothly, from so much of the circle as is within that corner, upward and outward, two, three, or four inches high, as at i; and that angle of the next stone, which

joined it, *k*, is rounded off exactly to fit it: Those pieces seem properly to belong to this last, tho' shelled off and sticking to the other, without any seam at the union; the mark which separates these angular bits from their proper stone is a little curve line on each side the angle of the pillar, rising from the point where the circle touches or intersects the sides. Where the circle is distant from any side, the space between is seldom flat, but the stone is continued up uniting the two angular bits, and hollowed away on the inside, from the circle up to the outside, which face *m* it terminates in a curve line; the next stone *n* has that side, and its angles which joined the former, pared so as to want what the other has beyond its main body; where the whole circle is within the polygon, one joint has all these angular pieces united, making a pointed rim quite round, rising highest at those angles and sides *p*, which are farthest from the circle; the other has all its end rounded off from its circle to the outside, most being taken from the sides and angles *q*, that are farthest from it; the whole part so pared, taken all together, seems a small part of a convex globe, as the inside of the rim is of a concave one, and being two or three inches wider above than below, one end of each stone slips out of this rim, without its angles, leaving them to constitute it, *14*, by sticking to the next stone; these angular parts stick generally to the under stone, whether it be convex or concave, but the greatest number of stones have not only part of the rim, but of the inner convexity or concavity also, sliced off as it were by two or three of its broadest sides, some by all. The circle is often intire within the polygon at one end, yet at the other end of the same stone it is cut off by one, two, or three of its sides *2*, and Fig. 1. Neither is the cavity in one end exactly equal to the rising on its other; both the hollow and swelling of some stones sink or rise uniformly from the very points of the angles, some not above an inch high in the middle, of which sort seem the original tops, *3*, a joint, *4*, having a double convex in it. The angle at top and bottom of some stones, *8*, are rounded neatly off together, and some angles are pared quite to the other end, *11*, before it comes to a point.

II. *Marmaro-proseron nigrum columnare et polygonum Basaltes Misenus dictus.*

Basaltes antiquorum, ab omnibus fere authoribus ita quidem, sed minus adequate, cognominatus, scil. a sequentibus: Agricola de Nat. Foss. l. 7. Kentman's Nom. Foss. p. 54. N°. 7. Gesner de fig. Lap. p. 20. & seq. cum Icone, p. 86. & p. 96. Albinus's Meisznsische Berg Chronica, p. 161. Cæsalpin de Metall. p. 92. Imperat. Hist. Nat. l. xxiv. c. 10. & l. xxv. c. 8. Schwenckfelt's Cat. Foss. Silesiæ, p. 385. Kircher's Mundus Subterr. l. viii. Sect. I. c. 9. p. 31, & 32. cum Icone, & Sect. III. c. 6. p. 83. Boet. de Boot Hist. Lap. & Gemm. l. ii. c. 273. p. 496. cum fig. Lachmund's Oryctogr. Hildesheim. c. 19. p. 60. Worm. Mus. p. 42. Charlton de Foss. p. 245. N°. 1. Mylius's Saxonia Subterr. P. I. p. 78. Volkman's Silesia Subterr. p. 38. Valentini Aurifodina Med. p. 41. Cappeller's Prodrom. Crystallogr. p. 25. Kundman's Promt. p. 200. N°. 15. Bruckman's Epist. Itin. Cent. II. Ep. 25. p. 237. N°. 31. & Supplem. ad Cent. II. p. 1261. Pott's Lithogeognosia. Wolterdorff's Syst. Min. p. 19.

This

This species of *marmaro-proseron* differs little from the foregoing kind, either in texture, hardness, or colour, but its manner of growth alone, which always is in angular pillars of one solid intire stone, and not composed of joints or pieces laid on each other, determines it to be a different species.

This kind is also very rare; the following places where it is found, are, however, particularly mentioned by authors.

A great groupe or assemblage of pillars of it is found at Stolpen, a castle belonging to the electors of Saxony, on the confines of Bohemia, and about three miles from Dresden; the castle and the adjoining buildings are built on it; Agricola and Gesner particularly give us an account of the place: The pillars are generally a foot and a half thick, and about fourteen feet in height, (Gesner says seventeen German ells high) but how far they penetrate in the ground no man can tell; they are quite free and clear from any other substance, and form a stratum of themselves; they are very thick set and close to each other, in a parallel order, and perpendicular to the plain of the horizon; they are chiefly heptagons and hexagons, sometimes pentagon pillars occur, but quadrangular pillars are very rare; exteriorly they are smooth or without any striæ, &c. on their surfaces; their substance is excessive hard and weighty, and they are of a ferrugineous or dull black colour.

Pieces are broken off these pillars with very great difficulty; for on account of its great hardness, it is used as anvils by smiths, bookbinders, goldbeaters, &c. Gesner says, to make the pieces fit for that purpose, they use a particular kind of saw, not toothed like the common sort, but its edge is even or strait and blunt, and while sawing they continually fill up the crevice or division with sand; nor can a middling piece even in this manner be sawed in less than eight days time, and at a great expence; it is also an excellent touchstone for metals.

The said author also gives an icon of a groupe of these pillars, which de Boot copies from him; but their figures seem to be erroneous, or not to answer nature, as they have topt all the columns with pyramids of the same number of sides, and represent them exactly like perfect crystals.

Schwenckfelt and Volkman inform us, that in Silesia pillars of this stone are found, by Lauban, on the river Queis, in a stone quarry, by the gate of that place called Bruder Thor; also by Greiffenberg, in the village Weise, and at Greiffenstein, in the duchy of Javer; the castle of which latter place is built on them; but the pillars there are somewhat imperfect and irregular.

Agricola, and from him Lachmund, mention a hill opposite to the castle of Mariæburg, in the bishoprick of Hildesheim in Lower Saxony, which is full of beams or pillars of stone, exactly like wooden rafters or beams, whose tops here and there rise above the surface of the earth; they are tall, stand placed in groupes, or many together, and when violently struck with iron or stone smell like burnt horn, and in other respects resemble the black marble of that country. These authors, however, mention a remarkable circumstance of their pillars, which is, that they have a black earth in the middle of them; and tho' they do not tell us the precise figure of them, yet it seems probable, at least, that some were square, which makes them call them *trabes lapideæ*; therefore they likely are of this species of *marmaro-proseron*.

Kircher

Kircher says, that in Tuscany, near Bolsena, about a thousand paces towards Mount Flasconium, on the left of the lake of Bolsena, there is a rock which entirely consists of parallelopiped columns; he gives an icon of a groupe of them, which are truncated at their apices, stand perpendicular to the plain of the horizon, and parallel and close to each other; and tho' he does not describe their substance and colour, yet as he expressly likens them to those of Stolpen, they are very probably of this same species.

III. *Marmaro-proseron nigrum, Basaltes antiquorum verus.*

Plin. Hist. Nat. l. xxxvi. c. 7. Imperat. Hist. Nat. l. xxv. c. 8.

This species of black *marmaro-proseron* also differs little from the other two kinds; it is of a finer constitution, is capable of a much higher polish, and is fitter for the sculptor's use, but its manner of growth alone likewise characterises it as a different species from the two above described kinds.

This species is never found in pillars, but always forms continued strata, like free-stone, marble, &c. The antients had it from Ethiopia; and by specimina, and credible accounts I have received, there are strata of it in Saxony, and other parts of Germany.

It strikes fire freely with steel, and readily vitrifies.

Most authors have erroneously made this Basaltes of the antients the same species with the two foregoing kinds; indeed their texture, colour, hardness, &c. no ways essentially differ, and as those authors did not attend to the characteristic of their different manners of growth, the error was at first easily made, and has more easily been continued, as the writers on fossils have generally copied one another.

Pliny, who is the chief antient author that mentions the Basaltes, describes only its great hardness and its colour, in which particulars it resembled iron (1.) He does not indeed expressly mention any thing of its manner of growth; but when he declares, that the colossal statue of Memnon at Thebes, and the statue of the Nile at Rome, were made of this stone, it is to be concluded that his Basaltes must have been a stone found in continued strata, since it is not only improbable, but also impossible, to have made such large statues of a stone which grows only in solid columns, and much less of that kind of which the pillars are made up of so many joints or pieces.

It may be objected, that Pliny was very often misinformed and erroneous as to the facts he relates; but in the present case it is otherwise, since those monuments of antiquity now remain as witnesses to his relation; for the statue

(1) Invenit eadem Ægyptus in Æthiopia, quem vocant Basalten, ferrei coloris atque duritiæ. Unde et nomen ei dedit. Numquam hic major repertus est, quam in templo Pacis ab Imperatore Vespasiano Augusto dicatus: Argumento Nili, xvi liberis circa ludentibus, per quos toti-

dem cubita summi incrementi augmentis se amnis intelliguntur. Non absimilis illi narratur in Thebis delubro Serapis, ut putant, Memnonis statua dicatus: quem quotidiano solis ortu contactum radiis crepare dicunt. Plin. l. c.

of the Nile is yet preserved in the Vatican gardens at Rome (2); and we are informed by a late learned traveller (3), that among the ruins of antient Thebes, in upper Egypt, are remains of two colossal statues of *black granite*, (for so he erroneously calls the stone) in a temple to the east of that place; one of which by many is thought to be the said statue of Memnon so famed by the antients; for that at the first or second hour, as they pretended it uttered a sound, occasioned, as they would have it, by the rays of the sun striking on it; and besides these two famed statues, many other antique works, as statues, vases, &c. of this stone are still preserved at Rome.

The *Basaltes* being an excellent touchstone, authors have confounded it with the touchstone of the antient Greeks called by them *Basanos*, *Basanites*, *Lapis Lydius* or *Heraclius*, &c. and which were, probably, only black jaspers; they have even gone so far as not only to make them the same stone, but to derive their different names of *Basaltes* and *Basanos* from one origin; viz. from *βασανίζω*, to try, to prove; whereas they are from quite different sources, for tho' the *Basanos* or *Basanites* is indeed derived from the above Greek word, yet the *Basaltes* was not even known to the Greeks; neither is the word in any wise of Greek origin; for Pliny expressly tells us it is an Ethiopic or Egyptian name; and, as Gesner judiciously observes that those languages have an affinity to the Hebrew, it is reasonable to conclude, that the name of *Basaltes* is a corruption of the Hebrew word *ברזל* *Barzel*, which signifies iron, a very adequate name for a stone, which they describe to be of the colour and hardness of iron; besides, we find no account that it was ever used as a touchstone by the Romans.

Gesner, de Boot, Bromel, Wallerius, Hill, and many other authors affirm, that the touchstone is a kind of black marble, or that most black marbles may serve for touchstones; it is true, black marbles take the colours of metals, and may be used as touchstones in the antient manner mentioned by Theophrastus (4), and Pliny (5), that is by touching on them with needles of different alloys; which manner is still in use in Germany, and other countries; but in the manner of trying them with aqua fortis, it is very absurd to use any calcareous substances, as the acid will immediately destroy the substance of the stone, and consequently affect and somewhat deface the streaks of the metals; it is therefore evident, that no marbles which are also of too soft a nature, can serve that purpose; but to have a good touchstone, one must chuse a black stone of this or the jasper genus, on which the aqua fortis will only dissolve the copper, silver, &c. without touching the gold, or affecting the stone: this genus is, however, certainly to be preferred, as a nice touchstone should only have a certain degree of polish, and should be of a compact fine texture, and neither too hard, nor too soft; whereas the jaspers are in reality too hard, and do not shew to that exact nicety, the different degrees of alloy; for the touches of the metal give them a higher lustre than their natural polish, and that lustre of itself hurts the distinctness of the streaks made on it.

(2) Visitur hodieque id marmor in Vaticanis hortis. Expressere ejus effigiem Ortellius in ipsa operis geographici fronte, et Oisellius in calce Thesauri rumismatum. Harduin's Pliny, l. c.

(3) Dr. Pococke, in his travels, or a description of the east, &c. Vol. I. p. 101, & seq.

(4) Hill's Theophrastus, p. 113.

(5) Hist. Nat. l. xxxiii. c. 8.

The

The confusion among authors in regard to their ranging the touchstone is not only very remarkable, but also surprising. They all agree to make it a particular species, and of a different genus from the jaspers. This in reality is the case, as most touchstones are of this genus, which I have first formed and named. Imperatus (6) places it as of affinity to the *Basaltes*, tho' found only in masses. Woodward, in one place (7), ranks it with the slate, the hone, and the oilstone; and in another place (8), among his *saxa* or *stones found in large masses*. Wallerius (9), Bromel (10), Richter (11), and others make it a black marble; and Pott (12), considering that it had not the calcareous nature of marble, neither that it was of the jasper genus, in a strange manner ranks it among the *argillaceous* and *pure schisti*, or slates, as Woltersdorff (13) also does.

IV. *Marmaro-proseron albescens*.

Le Marbre blanc, nommé di Foresto dans le Piemont. Argenville, Oryctolog. p. 197.

This kind is of a sullied white colour, with a glance of red; it admits a good glossy polish, full of bright silvery spangles, and a smooth surface, and is an agreeable stone. It is of a granulated texture, fine and compact; for the granules, which are small, bright, and lucid, are firmly concreted together, and are intermixed with small sparks of silvery micæ, which form the spangles that appear in the politure; it is heavy and hard, but will not strike fire with steel.

There are quarries of this stone at a place called Furesto in Piedmont, and on that account it is called *Furesto marble*.

V. *Marmaro proseron obscure viride*.

This kind is of a dark dull olive-green colour, quite uniform, or without the least shade or variegation; it is of a coarse, solid, uniform texture, and destitute of any brightness; it admits a fine smooth surface, with some glossiness, but no good polish; it is very heavy and hard, and strikes fire freely and plentifully with steel.

The specimens, from which this description was made, I received from Italy, by the name of *Oriental* or *Egyptian basaltes*.

VI. *Marmaro proseron prasinum*.

This species is of an uniform, agreeable pale or sea-green colour; it is of a solid texture, and quite destitute of brightness, bears a very smooth surface, but is not capable of any good polish, is moderately heavy and hard, and will not strike fire with steel.

I received this kind from Italy, by the name of *Paesina di Firenze moderna*.

(6) Hist. Nat. l. 25. c. 8.

(7) Method of Fossils, p. 10. N^o. 34.

(8) Cat. of Fossils, Cat. I c. 6.

(9) Mineralogy, species 44. N^o. 2.

(10) Lithogr. Suec. c. 5. p. 34. & p. 36.

(11) Mus. p. 187.

(12) Lithogeogn. vol. ii. p. 197.

(13) Systema Minerale, p. 17.

VII. *Marmaro-proseron viride.*

This kind is of an uniform deep green colour, near black and opake, but is thick set with spaces and veins of a very fine semipellucid emerald green colour; these spaces and veins of emerald green are not, on first view, easily seen, on account of the great darkness of the ground colour, but when the stone is laid inclining, or is any wise greatly exposed to the light, it then is a most beautiful object, being an opake green stone, finely diversified and intermixed with elegant emerald like spaces and veins; it is capable of a very fine polish and of a perfectly smooth surface, its texture is fine, very compact and uniform, for the emerald veins differ only from the rest of the stone in their semipellucidity and colour; it is heavy, very hard, and strikes fire with steel.

It is an *Italian* stone.

VIII. *Marmaro-proseron laete virens viridi obscuro maculatum.*

The ground of this stone is of an agreeable light green colour, and is very thick set with irregular spots, not large, of a dark green, near black; it bears a fine glossy polish, and an even surface; and is a very pretty species.

The body of the stone, or light green substance, is of the nature of the nephritic stone, that is, unctuous, glossy, not very hard, like a talc to appearance, and when in thin pieces somewhat semipellucid; the dark green parts are pure flakes of micæ like those of the granite; these substances are not concreted or cemented together in such a manner as to form a strong, compact, solid body, but consist only of lumps or grains clapt together, so as to cohere very firmly, and resembling the structure of the granite; on which account, like that stone, this kind, even when polished, always appears full of cracks.

It is moderately heavy and hard, but will not strike fire with steel.

I received this kind from *Italy*, by the name of *Verde di Prato antico*.

IX. *Marmaro-proseron obscure viride, Ophites s. Marmor serpentinum Zæblitzense authorum.*

Forſan *ophites candidus*, Plinii Hist. Nat. l. xxxvi. c. 7. & c. 22.

Ophites, s. Marmor serpentinum Zæblitzenſe, Agricola de Nat. Foss. l. vii. Gefner de fig. Lap. p. 99. Kentm. Nom. Foss. p. 53. N°. 2 & 3. & p. 37. N°. 6. Boet. de Boot de Lapid. & Gemm. l. ii. c. 278. p. 502. Worm. Mus. p. 43. O. Jacobæi Mus. Reg. Dan. p. 37. Christ. Lehmanni Historischer. Schau-Platz, &c. 4^{to} p. 449. Mylius Saxonia Subterr. P. I. p. 31. Valentini Aurifod. Med. p. 42. Kundm. Prompt. p. 205. N°. 117. & p. 206. N°. 118. & seq. p. 236. N°. 65. & p. 237. N°. 67. Bromel's Lithogr. Suecana, c. 5. p. 34. Mus. Richter. p. 200. Pott's Lithogeognosia, Vol. ii. p. 177. Bruckman's Epist. Itin. Cent. I. Ep. 24. p. 4, 7 & 8. Ep. 25. p. 14. Cent. II. Ep. 13. p. 107. Ep. 26. p. 252. N°. 103. a 131. & Supplem. ad Cent. II. p. 1263. N°. 27. a. 40.

Serpentino Nero crinito. Imperat. Hist. Nat. l. xxv. c. 8.

Serpentine marble called Ophites. Grew's Mus. Reg. Soc. p. 315.

Marmor virescens mollius, venis et maculis albidis et nigris variegatum: Ophites candidus antiquorum; Marmor Zæblitium. Hill's Hist. Foss. p. 485. N°. 3.

Ollaris

Ollaris solidus virescens maculosus polituram admittens. Marmor serpentinum. Marmor Zoblizenfe. Wallerius's Mineralogy, Species 136.

Smeclites virescens maculis et venis nigris; Lapis serpentinus; Ophites. Wolterstorff's Syft. Minerale, p. 16.

Talcum particulis impalpabilibus, solidum viridi maculatum; Serpentin-stein, Linnæus's Syft. Nat. p. 156. N°. 3.

Talcum serpentinum, f. Talcum particulis impalpabilibus, solidum maculatum. Mus. Tefsin. p. 20. N°. 3.

This *marmaro-proseron* is of a pretty fine compact texture, but always breaks into rude irregular pieces, rough, and quite destitute of brightness; it is heavy and moderately hard, will not strike fire with steel, but on being struck becomes whitish and powdery; it always bears a very smooth glossy surface, and is slightly unctuous, and on that account it is capable of but very little polish.

The common sort, or dark green near black, thickly mottled with a dull light green, burns to a brownish reddish colour, streakt with slight blue veins, and set with some goldish spangles, and becomes very hard; the variety *m*, burns to a pale dull brown colour, and also becomes very hard; but the black eye-like spots burn to a glossy golden hue, and prove to be regular lumps of micæ, neatly inlaid in the stone.

The pieces of this marble are often of so very different colours, that they appear to be as many distinct species; but as by all accounts we find that they are only different parts of the same strata, they are truly to be reckoned as mere varieties of the same species.

The most common sorts are of a dull green colour, of different degrees of shades to near black, and thickly mottled or waved, generally with small, but sometimes with large waves of a lighter tho' also dull green, or else it is thickly variegated with slight veins or streaks of black, which run into one another, and form a rude net-work.

It is very often mixed or interspersed with fine small and large scales or flakes, and sometimes with irregular veins of a glossy gold coloured mica, which are spangled in it, and give it a very glittering appearance.

Veins and large spaces of nephritic stone, of a fine texture, of a dark and also of a light green colour, are very frequent in this stone; insomuch that I have even seen slabs of it almost intirely nephritic; and veins of agate and chalcedony are sometimes found in it; but that dug at Zwickau is very frequently full of chalcedony.

These are the most general colours and appearances of this stone; the other very remarkable varieties, which I have seen or found described by authors are as follow.

Of a black ground *a*, spotted, veined or variegated with red of different shades; and *b*, clouded, veined, or spotted with green of different shades.

The ground grey of different degrees of colour, *c*, spotted with a few black spots or veined with black; *d*, veined with red, and *e*, veined with green.

Of a brown colour *f*, with black spots like eyes: the brown sorts are rare.

Of a red ground ; these are rare, and much esteemed ; the red sometimes appears like a mere tinge on the stone, at other times it is of a fine bright colour, but generally deep or very dark pieces of a red ground are found ; *g* spotted and veined with black ; *h*, with white, both in veins and variegated ; and *i*, with grey.

Of a fine light greenish yellow, *k*, thinly set with small round black spots.

Besides the common colour of this stone already described, there are many varieties of greens of different shades, but a light or grass green is not common ; pieces of a green ground are found with *l*, small black spots thinly set, sometimes very thickly, and in an elegant manner, and sometimes the spots are not regular or distinct, but run into each other, and thereby form a beautiful variegation ; in other pieces, *m*, the spots are large of the bigness of peas, and perfectly regular, and are as if inlaid in the stone, being quite free and independent from the substance of it, tho' so closely joined, as not to be freed from it ; *n*, with white spots like eyes ; and *o*, spotted or veined with red.

The pieces which are variegated with many colours, are *p*, grey, black and red, spotted, veined, &c. in different manners ; *q*, red and black with white ; *r*, green with black and white ; *s*, green and red with spots like eyes ; and *t*, green and red, with black spots like eyes.

The chief quarries of this stone are at Zœblitz, a small city in Misnia, which lies betwixt Marienberg and Olberhayn, on the confines of Bohemia, and from this place it has derived its name of *Zæblitz-marble* ; the quarries were discovered and dug, and the uses of the stone first known, about the year 1545 ; in 1577, from the first discovered quarry, there was raised a block of thirty hundred weight, which was polished, and set up for a memorial in the arsenal of Zœblitz ; there is a house in that city, where the electoral supervisor receives for the Elector's use, all the very large blocks of ten, twenty, or thirty hundred weight, and near an ell long ; and several such large beautiful blocks of it are kept at Dresden ; the smaller blocks are the proprietors or quarrymens property ; but it is observed that large blocks are not now found so frequently as formerly ; the first quarry was exhausted in 1609, but several others were immediately discovered ; at the beginning of the last century they only hewed it roughly, and did not make those various utensils now made of it till some time after, when it became so celebrated as to form a great trade to this city, and to be exported thence all over Europe : The trade in it is still so great, that the workers of it are even incorporated into a particular company, which has great privileges granted it.

There are also quarries of it at Rochlitz and Zwickau, but the stone is esteemed inferior to that of Zœblitz ; indeed the walls of the latter place are partly built with it. There are quarries of this stone likewise on the Fichtelberg, at Rohrenhoff, near Goldcronach, and at Wunsiedel, in the margraviate of Bayreuth ; in Voigtland ; and also some other parts of Germany.

This stone, on account of its variety of colours and its softness, is turned and worked into cups, plates, vases, mortars, and various other utensils, and even household furniture, which are in common use all over Germany, and are greatly esteemed.

The name of *serpentine-marble* has been given it, on account of its being spotted, variegated, &c. like the skin of a serpent, as also because it is greatly celebrated

celebrated as an excellent antidote against all poisons; this virtue is founded on an observation, that no toad, serpent, insect, or any venomous animals whatever, have ever been found in its quarries, or even in the neighbourhood of them; it is also superstitiously cut into heart-like shapes, and is used as amulets for children; these amulets in Germany are vulgarly called *Schrecksteine*, i. e. *Stones to preserve one from terrors*; however its name and virtues seem more probably to be remains of the tradition of the serpentine marbles or *ophite* of the antients, which had the same name and virtues attributed to them; and more so, as this stone seems probably to be their white *Ophites*, as will be hereafter shewn.

In medicine its use has also been applauded by many: tinctures, pills, and plaisters have been prepared from it, and used with success, in the gout, stone, colic, and other distempers; but by the more judicious, its medicinal virtues are much discredited.

Some authors have imagined the stone to be the Ethiopian *Tbyites* of the antients, which was of a green colour, and of which they made mortars; but that opinion is without foundation; however, it probably is their *Ophites candidus* or *albus*, for Pliny (14) says, the *Ophites candidus* was soft, and that it was worked into mortars, vases, &c. and, as pertinent to the purpose, continues his account with the *lapides Siphni et Comensis*, which were of so soft a nature, as to be turned and easily wrought into pots; indeed this allusion of Pliny's is not even disregarded by later writers, who make his *Lapis Comensis* now vulgarly known by the name of *lapis lebetum*, as a species of the same genus, in which they range this *marmaro-proseron*; it is true the epithet *candidus* no wise quadrates with the dark colour of this stone, which is even seldom found with a white spot or vein in it; but that name is given it to denote its softness, in like manner as the softer sorts of gems have been generally called females; on the contrary, the *Ophites niger* seems to be called so, on account of its great hardness; for its colour, which is of a fine green, is as little answerable to the term *niger*, as that of the other to the term *candidus*; further, I have already hinted that the virtues this stone is famed for, as well as the cause of its name, seem only to be derived by tradition, from the *ophite* of the antients; and lastly, I have observed, p. 209. *supra*, that the antients seem to have called those kinds *ophite* only, which did not calcine, were so variously variegated as to resemble the spots on serpents skins, and which they imagined were of great efficacy against the bites of venomous animals; it is on all these conjectures, and which seem to me to be of some weight, that I conclude this species of stone to be the *ophites candidus* of the antients.

The genus this stone should be ranged in, is an argument much debated by our present lithographists; the elder authors, as Agricola, Gesner, &c. rank it as a marble, on account of its being capable of a polish, and that it is found

(14) Hist. Nat. l. xxxvi. c. 7. Ophites — duo ejus genera: Molle candidum, nigricans durum — &c. 22. Ophites albus — est enim hoc genus Ophitis ex quo vasa etiam et cados faciunt. In

Siphno lapis est, qui cavatur tornaturque in vasa coquendis cibis utilia, vel ad esculentorum usus: quod in Comensi Italiae lapide viridi accidere scimus.

in

in strata, in which they are followed by several later writers; others, on account of its softness, reckon it a kind of alabaster; those authors who are entirely bent on chemical systems, finding it neither calcareous nor vitrifiable, have ranged it among their *apyri*, or those stones which evade the force of fire; and some of them have placed it among the talcs; while others have made a particular genus of it, distinct from the talcs, to which they have given the fantastical name of *ollaris*, on account that pots or *ollæ* are made of a species of their said genus; but if the chief characters of a body are to define its genus, *e. g.* its growth, texture, solidity, hardness, and colours, in all which particulars it is different from the genera in which it is ranged by the said authors, it of consequence ensues, that this genus, the species of which have all those characters, is the proper genus to which it belongs.

Notwithstanding the assertion of authors, that this stone is refractory, or an *apyrus*; the celebrated Henckel observes, that it melts *per se*, or without the addition of any other substances: Perhaps, says Pott, it is the metallic and other extraneous substances it contains, which dispose it to fuse in a violent fire.

X. *Marmaro-proseron cinereo nigroque variegatum.*

This species seems to be entirely of a dusky ash colour, the colours are so intimately blended together; but it is mottled or variegated very thickly and irregularly with a dull whitish or pale ashen colour (which seems to be the ground) and a pale black; it is capable of a very elegant polish, and of a perfectly smooth surface; its texture is somewhat coarse, and as if granulated, but is compact, uniform, and very bright or glittering; it is heavy, moderately hard, and will not strike fire with steel.

I received it from Franconia.

This kind may perhaps be the *tephrias* or *ophites cinereus* of the antients, the ground colour and black mottlings or specks much resembling the colour and spots of the skins of some kinds of serpents; and besides, it is not a calcareous stone, for I have given some reasons, p. 209. *supra*, to conclude, that the *tephrias*, and the other two species of antient ophitæ, were not of a calcareous nature.

XI. *Marmaro-proseron purpureo alboque variegatum.*

This is an elegant species; it is finely variegated with a peach blossom colour and with white; these colours lie in specks or small spaces blended together, in a most beautiful and agreeable manner; it is capable of an exquisite polish, and perfectly smooth surface, is of a fine uniform, solid texture, not quite destitute of brightness, very heavy and hard, but will not strike fire with steel.

There are quarries of this *marmaro-proseron* at a place called Corfaia in Piedmont, from whence I received it by the name of *Perfichino Brecciato di Corfaia*.

OBSERVATIONS on the MARMARO-PROSERA.

The affinity fossils have to one another in their principles, texture, manner of growth, and other particulars, should always be the guide of the judicious mineralogist to determine their various genera, species, and even varieties, and according to their said affinity or disagreement to each other to range them in the same or different orders.

It is on this maxim (which I shall pursue through my whole work) that I found it absolutely necessary to form this new genus of fossils, the bodies whereof have been hitherto very erroneously ranged. Most authors have placed them among the marbles, on account of their great agreement with those bodies, but erroneously, as they differ in an essential character, which is, of not being calcareous; some later authors, who seem to despise all systems of fossils, which are not built on a chemical analysis of them, have indeed noted that essential difference; and therefore as some of these bodies are vitrifiable, and others apyri or refractory in the fire, they have ranged them in the orders of vitrifiable and apyri, with other bodies which have no character of affinity to them, only this single one, but even on the contrary differ widely from them in all other characteristics whatsoever, all which differing characters they have past by, and rejected as useless; an example of this is seen in the arrangement of the *Zablitz-stone*, described species IX, which, as an apyrus, is placed in that order, but which bears no one other character of the fossils, which are apyri; on the contrary, it has many characters of other orders attending it; this stone by Pott is no where ranged, he only informs us (as a general writer) it is an *apyrus*; by Wallerius it is placed in a genus he calls *ollaris* (as has been already observed in its description) along with the *lapis lebetum*, a true talcy body, and with the black lead mica, if not a mineral substance; by Woltersdorf among his *lapides argillofi*, in a genus he calls *smectites*, along with the Nephritic stone, the red chalk or *rubrica fabrilis*, the steatitæ or soap earths, and the *lardites* or Indian *gypsum*, &c. and by Linnæus among the talcs; such arrangements must certainly always cause an inextricable confusion.

To avoid such confusion, and to compleat my design of making a regular arrangement of fossils, according to their affinity to each other, I have formed this genus of stones, which in the particulars of growth, polish, texture, colours, or beauty, &c. agree with the genus of marbles, but differ from them in that they are not calcareous; this one particular certainly sufficiently distinguishes these bodies and the marbles as different genera; but surely one characteristic only can never be allowed sufficient to distinguish a set of bodies, as different orders from another set of bodies, which agree with them in all other characters except that one, as *e. g.* for the *Basaltes*, and the *Zablitz-stone*, to be placed among the vitrifiable and apyri, rather than in a genus next to the marbles, which they agree with in so many other characters.

The affinity this new genus bears to the genus of marbles, I have expressed in the name given it, *viz. marmaro-prospera*, or stones of affinity to marbles, a name compounded of the greek words *μαρμαρον*, marble,

ble, and *περοσπον*, or *περοσπον*, *neighbouring, bordering upon, of affinity, or near to.*

As for those bodies of this nature, which are loose independent nodules, or are never found in strata, and which seem to this genus as the marmoroidæ are to the marbles, there is no need to form such another separate genus of them, since those nodules which are vitrifiable, of a fine polish, and great hardness, so as to strike fire with steel, as being loose independent masses are true jaspers; and those other nodules, which are not of such hardness as to strike fire with steel, and also differ in other particulars, can be truly ranged under another genus, of which I shall treat fully in its due place.

SERIES II.

CHAP. IV.

GENUS II. *The Granites.*

STONES of an irregular texture, concreted of separate large grains or parts, not blended or intermixed together into one mass or substance, so as to be compact and uniform, as the marbles, &c. are, but distinct from each other, rudely concreted, and only cohering firmly together; these parts likewise are not homogeneous, but are different concretions of *quartz* and *mica*. The bodies of this genus are of such great hardness, as freely to strike fire with steel, they ferment not with acids, and are vitrifiable.

I. *Granita fere nigra, præcipuè e micis nigris parvaque intermixta quartzæ quantitate composita.*

This species takes a smooth surface, but no good polish, its ground is black with a slight tincture of green spotted with white.

The chief substance or basis of this granite is a black *mica*, the quantity whereof is so great as to be full three quarters parts of its composition, and to give it a black ground. In other respects this species has great affinity to the granite called *granitello*, described species III. and seems to differ from it chiefly in the quantity of the *mica* it contains, therefore by some would be rather reckoned a variety than a distinct kind, but as it carries so specific a difference, I think it deserves to be ranked as a distinct species.

The *quartz* in this stone is equally dispersed in it; it is opaque, glossy and slightly tinged of a dull dark green colour, so as to be in very few spots of a whitish hue; in some places it appears of a tabulated structure, but mostly lies in solid grains or parts; the micaceous matter lies in large bundles or congeries in all directions, and rudely intermixed or blended together; they are extremely glossy and black, with a cast of dark dull green.

I have never yet heard of strata of this kind of *granite*; but vast large masses of it abound in the pavements of the streets of this metropolis, and nodules of it are frequent on most of our *English* shores.

II. *Granita albissima micis magnis nigris argenteisque notata.*

Moorstone, Woodward, Cat. G. e. 3.

Granita alba, durissima, nigro variegata; quæ incolis Cornubiensibus Moorstone. Hill's Hist. Foss. p. 498. N°. 1.

This stone generally takes a very high polish and good surface; is white, thinly spotted with large black spots or flakes of *mica*, and some of a dazzling silver colour, and is a very fine species of granite.

It is heavy, of a large gross, rude, structure, though the different grains or parts firmly cohere together, and form a stone of a very hard texture; the basis

is of a milk white opaque glossy *quartz*, of a tabulated structure, called *Feld-Spath* by the German writers, intermixed with lumps of a fine transparent and cristallin *quartz*, and considerable quantities of black and silvery micæ lodged irregularly and in all directions, some whereof are broad, others are small, and very glittering; the transparent *quartz* freely strikes fire, the opaque sort not so freely, and shatters much.

This granite lies generally in large strata, in some parts of England, chiefly in Cornwall and Devonshire; it does not lie over all the latter county, nor always over the tin and copper loads; it is also sometimes found in large loose masses; these strata are not all of one sort, but of several varieties of this same species, tho' they all are called by the general name of *Moorstone* in that county.

It is greatly used in building, and for ornaments of the simplest kind in Cornwall, and also in other parts where found; many fine tables of it have been worked of late years, which prove very beautiful; great quantities of it have also lately been brought to London, where, for its great hardness, it has been used for steps, posts, &c. in the streets.

There are also vast large strata of this stone in Ireland and in Hudson's Bay; that of Hudson's Bay is a variety of it, for the micæ in it are of a glossy silvery hue, and lie in very fair flakes, besides that there are very few grains or lumps of the pure cristallin *quartz* in that stone.

Linnæus, Syst. Nat. p. 186. N°. 6. exhibits a *saxum quartzosum spatiosum album, mica squamosa atra*, found in great quantities in the provinces of Angermannia and Dalarlia: and ibid. N°. 7. a *saxum quartzosum subspataceum albicans, mica squamosa auricolore*, of which the high mountain called Norby-Knylen, in the province of Medelpad, consists, both which Swedish stones seem to be varieties of this species of granite.

III. *Granita albescent micis parvis nigris frequenter maculata, Italica Granitello dicta.*

Granite from Arabia, Woodward, Cat. I. γ. 6. and Cat. L. δ. 3.

This species of granite is heavy, of a near even, or regular structure, the grains being generally small and closely cohering together, so that when broke it does not shew a very rude surface; its grains are chiefly of two substances, viz. the basis, which is an opaque *quartz*, is very glossy and of a tabulated structure, not of a pure white but dusky, with an ashen glance, and is thickly intermixed with bundles or congeries of deep black glossy micæ, for in this kind there are no lumps or grains of pure cristallin *quartz*.

This stone takes a very fine polish and surface, it is of a dusky ashen white ground, thickly spotted, though in an irregular manner, with small black spots.

There are very great quantities of this kind of granite found in the antient temples and other buildings of Egypt, Asia, and Italy; modern travellers distinguish it by the name of the *grey granite*.

Vast strata of this granite are found in the Upper Egypt, and in Arabia Petræa.

According to Mr. Tournefort, Voyage au Levant, vol. I. Letter 7. p. 236. there is scarce an island in the Archipelago but what abounds with this granite.

The most common granite of Europe is this kind. Masses of this stone, worn and rounded like pebbles, are very frequent on the shores of this island; and masses of it likewise abound in the pavements of the streets of this metropolis.

The

The specimen exhibited by Dr. Woodward, Cat. A. G. d. 38. is of this kind. The Doctor observes, that there are vast quantities of it at Edenhall in Cumberland.

In France there is a mountain of this kind of granite near Canes in Provence; the strata of it differ greatly in their dippings and thickneses. Mr. Tournefort informs us, l. c. that there are quarries of this stone in lower Normandy on the side of Granville, and that it is daily used in that country for door cases and chimney peices; he adds, that these quarries must reach a great way, for he received from St. Malo several sea plants, naturally sticking to pieces of it; and that father Truchet, being employed by the king to render the Dordogne navigable, discovered the finest granite in the world among the sources of that river. Argenville Oryctologie, p. 187. 204 & 406. confirms this account of the granite of Lower Normandy, and says it is got at an island called Chamsay, four leagues from Granville; he adds, it is hard to polish, though a very fine stone, and that all the works of the pier of that town, as also of St. Malo, are built with this granite. This latter author, ib. p. 498. mentions also grey granite to be found in the neighbourhood of Autun, and near the borough town of Nolay in Burgundy.

IV. *Granita alba paucis micis nigris distincta.*

This kind takes a fine polish and good surface; it is white spotted with black, the spots are very irregular, of a middling size and not thick set; in these particulars it differs from the last described stone, of which, though it might at first be taken for a variety, yet it certainly is a distinct species from it.

The grains or parts are rude, and do not form so compact a substance as the foregoing; they are of a white opaque quartz, sometimes also somewhat semi-diaphanous or horny, with a slight greenish cast, very glossy, and of a tabulated structure: the micæ are black, and imbedded in all directions.

I could never yet hear of any strata of this kind being found, but vast quantities of nodules and masses are very frequent on the shores of many parts of Europe, as well as of this island.

V. *Granita alba, micis magnis obscure viridibus adpersa.*

This kind is of a gross texture, but extremely compact, and the parts strongly concreted together; it consists of a glossy opaque quartz, of a tabulated structure, slightly tinged with a greenish cast, and a white, opaque, glittering, grained quartz; for pellucid quartzose grains it has none; intermixed and imbedded in these substances irregularly, and in all directions, are vast quantities of beds or masses of micæ, of very large flakes, generally above one quarter of an inch over, of a dull deep or blackish green colour, very glossy and fine; the quantity of these micæ is so great, and their flakes so large, that this granite, rather looks like a green stone variegated with white than otherwise; it is very hard, takes a fine polish and surface, and is a beautiful species of granite.

There are strata of this granite, and also loose or scattered masses of it, found in several parts of the county of Downe in Ireland, more especially about Newry, which town is partly built with this stone.

VI. *Granita rubescens, granita orientalis rubra dicta.*

Pyropæilos & *Syenites* Plinii, Hist. Nat. l. 36. c. 8.

Granitum rubrum s. *granito rosso orientale*, Cæsalp. de Met. p. 94. Imperat. Hist. Nat. l. 25. c. 8. & l. 26. c. 9. Mus. Richter. p. 188.

The Granite, Granita, Woodward's Method of Fossils, p. 11. N°. 41. Cat. Foss. I. γ. 5. and Cat. L. δ. 3.

Saxum granosum, Granitstein, Woltersdorff, Syst. Min. p. 15.

Granite rouge, Porphyre rubens, lapillulis nigris. Porphyre Ægyptiacus. Syenites, Stignites, Pyrrhopæilon, Granito rosso Italice. Wallerius's Mineralogy, Species 99. N°. 4. Pott's Lithogegnosie, vol. II. p. 167.

Granita rubra, durissima, nigro & albo variegata; quæ pyropæilos antiquorum, Syenites Plinii, & Granita orientalis recentiorum. Hill's Hist. Foss. p. 499. N°. 2.

This kind is heavy, of a moderately fine texture, extremely compact, hard, and weighty, for the concretions cohere very strongly together; these concretions are of many sorts, and form a stone of great beauty, the basis is the opaque *quartz* always met with in the granite kind; it is not of so regular a tabulated structure as in some other kinds, but more rude or harsh, and is not white, but tinged with variety of colours very striking to the eye, the chief whereof are fine red and reddish casts, from whence this kind is peculiarly called the red granite, some casts of yellow, purple, white, &c. which together form an elegant variegation; great quantities of lumps or grains of a fine *quartz* lie intermixed, this *quartz* in some parts is quite pellucid, in others of a fine reddish cast, and the micæ, which are generally black, lie not in large flakes, nor in any great quantity, but are interspersed irregularly and in all directions in the stone.

It takes a very fine high polish, and smooth surface (tho' like the other stones of this genus, it is not quite free from flaws or cracks, occasioned by slight vacuities, which occur between the different concretions) its elegance and beauty is then inexpressible; the chief ground is red, of different casts, with spots of white, yellow and purple, flakes of black, which are the micæ, and spaces of pellucid and colourless crystal.

This is the most general appearance of the red granite; but however many varieties of it occur, which deserve notice; these varieties, it is true, seldom are seen in the slabs brought from the East, but are mostly the growth of many parts of Europe.

The first variety has very few or no micæ, tho' the other parts are of the same substances, texture, and structure, as the true oriental granite, and in this variety, the yellow spots or spaces are very frequent and fine.

The second is of a much finer and compacter texture; it is quite composed of the opaque *quartz*, glossier, of a more tabulated structure, and of a finer deeper red colour, than the oriental; this has very little pellucid *quartz* in it, but vast quantities of small black micæ are every where intermixed; this variety is of as great beauty as the oriental kind, as it is capable of a fine high polish, and that the ground is of a fine red colour, thickly spotted with black.

The third variety has few or no black micæ; it is of an exceeding compact hard texture, and the grains so strongly cohere, as to appear almost blended together; the opaque *quartz* is of a fine high red colour, the pellucid *quartz* not much.

much in quantity, and great spaces of a dull dark greenish *quartz* occur, which all together form an agreeable variegation.

The fourth is quite composed of the opaque *quartz*, of a fine light red colour, with grains of the pellucid *quartz* intermixed, but has no *micæ*; this variety is pretty compact and hard, but bears little polish, and is of no great beauty.

The fifth is of a harsh texture, tho' not large grained, it intirely consists of the opaque red *quartz*, very coarse and impure, or much debased with earthy matter, and has vast quantities of black *micæ* imbedded in all directions; this bears little polish, and is not a fine stone.

The sixth variety is of a small grained texture, firm, compact, and hard, it is composed of a glittering grained white opaque *quartz*, a glossy tubulated white *quartz*, a red glittering grained *quartz*, many lumps of pellucid *quartz*, and some few *micæ*; this variety bears very little polish, and is of no great beauty.

These are the chief varieties of the *red granite* which have come to my knowledge, for it is impossible to characterise the other slight differences of this kind of stone which occur in the strata and masses of it, found in many parts of the world.

The true oriental red granite, of which the temples, obelisks, and other antient buildings that abound in Egypt, Asia, and Italy, is built with, was got by the antients from the Upper Egypt; Pliny expressly informs us, from near Syene in the Thebais, for which reason this stone also obtained the names of *marmor Thebaicum*, and *Syenites*. The vast quarries of this granite are seen in that country to this day. Paul Lucas, who, in 1714, travelled by order of Lewis XIV of France, into those parts, after informing us (1) that Egypt is every where full of magnificent ruins of granite and porphyry, gives us the following account of the state of those antient quarries, when he visited them; the quarries, says that author, from which the antients drew this vast quantity of granite, still remain, and are seen three days journey beyond Syene in Saidy, in Upper Egypt; certainly an immense work, and great industry was used to cut or dig from those rocks such vast masses of stone, and very curious machines to carry them down the canals of the Nile, which they had dug with so much art, that they were even brought to within the very quarries; and, when the Nile was overflowed, the rafts or floats on which they carried the column or obelisk they had formed, was brought by the canal to the very place where it was cut and dug from, and they there placed it on the float to convey it to the place it was destined for, which I have seen with a wonder words cannot express. The history of that famous obelisk, which Sixtus V erected in the front of the Vatican, is well known, and with what expence it was carried to Rome on ships made purposely for it.

What yet remains of these quarries sufficiently destroys the opinion of those, who imagine that this stone was an artificial composition, the secret of making which is lost. Columns, half cut and finished, are yet seen in these quarries; others but just begun, and a vast number of others ready to carry to their destined places; one of these quarries is on the bank of the Nile, and it was easy enough with ropes to carry to the river what was wrought or finished, by a decline, or slope, which seems to have been made for that purpose, so much was

(1) Troisième voyage au Levant, Tom. 3. p. 154 & 162.

this antient people, industrious and quick in profiting of those advantages which nature offered them.

A later traveller, the Reverend Doctor Richard Pococke (2) also gives an account of these granite quarries: "The antient granite quarries, says the Doctor, lie about a mile S. E. from the ruins of Syene, near the cataracts of the Nile, on the borders of Ethiopia; all the country to the E. of the islands and bed of the Nile are of a red granite, which is the Thebaic stone mentioned by Herodotus; the quarries are not worked in deep, but the stone is hewn out of the sides of the low hills. I saw some columns marked out in the quarries, and shaped on two sides, particularly a long square one, which might be designed for an obelisk; they seem to have worked in round the stones with a narrow tool, and when the stones were almost separated, there is reason to think they forced them out of their beds with large wedges, of which there are great signs in the quarries in all parts; in some places I observed channels marked out about three inches wide, and holes cut in those channels at certain distances, as if for their chissels to go in, so that probably they worked down with the chissels at the bottom, and on one side of the stone, and then forced the stone out of its bed with wedges. I could not find any other ground why some persons have affirmed that there are pyramids here, but certain quarries cut out into steps up the sides of the hills, which may have caused ignorant people to take them for the remains of pyramids, as some of the pyramids are built in that manner."

The whole country of Arabia Petræa is a mass of granites, of different kinds, the rocks, even the ridges of mountains, quite to the Red sea, consist of granites, and all the north part of mount Sinai, for above half way up, is of this oriental kind (3).

The red granite is found in many parts of Europe; in England I observed great quantities of pretty large masses, like rubble stones, to lie on the road from mount Sorrel to Quarndon in Leicestershire; I was informed they lie just under the upper soil or surface.

There are many fine tables, and other ornamental works of this kind, equal to the finest oriental granite, at mount Edgecumbe in Devonshire, the seat of the Right Honourable the Lord Edgecumbe, which his Lordship has had worked from stone found in the adjacent parts.

Masses of this stone, worn smooth and rounded like pebbles, are found in great abundance on the shores of this island, e. g. of Yorkshire, Lincolnshire, Cornwall, Flintshire, &c. and Woodward, Cat. E. b. 25. observes they are very common in the brooks of Cumberland.

The *telaugium rubescens albo et nigro variegatum* of Hill's Hist. Foss. p. 549. N^o 3. which that author says is found plentifully on the Guernsey shores, are only masses of this kind of granite.

There are great quantities of the 4th variety above described found in several parts of the county of Downe in Ireland, chiefly about Newry, which town is partly built of it; they call it *mountain gritt*.

(2) Description of the East, Vol. I. p. 117. & 3. Meth. of foss. p. 11. N^o. 41. Pococke's description of the East, Vol. I.

(3) Woodward Cat. I. γ 5. Cat. L. p. 137, 140, 144, 145, and 147.

The kingdom of France has many places which produce this granite; the province of Mans yields a rough coarse sort, not capable of a good polish (4); the whole division of Provence, especially not far from Canes, yields a granite, only differing from the Egyptian, of which the obelisks at Rome are made, in that the *crystallin quartz* and *mica* abound in it, whereas in the Egyptian, the *opaque quartz* is the basis or principal substance, and forms larger concretions.

At Frejus, the antient Forum Julii, in the ruins of the fine aqueduct, the fine amphitheatre, and other antient Roman edifices, there is of this granite used; the present inhabitants however do not at present build with it, it is now too common to merit being admired; the towns of Semur and Avalon in Burgundy are built on rocks of fine red granite, which bears a good polish; but at Rouvray, a village on the road from Dijon to Auxerre, the finest granite, approaching greatly to the oriental, having a very fine grain, is found (5). In Spain, the Escorial, the castle of Madrid, and other royal palaces are built with a granite like that of Provence; the Spaniards have, for many centuries, built with granite; they, no doubt, first learnt it from the Phœnicians or the Greeks, but they have not been careful enough in the choice of their stone, as will be easily seen in the great columns of the *placa* of Seville, which are much fretted and worn, tho' they are, by many centuries, more modern than the obelisks at Rome.

The *granita durissima, rubro albescens, luteo et nigro variegata* of Hill's Hist. Foss. p. 500. N° 3. of which he says there are immense strata in the island of Minorca, is not, as he would infer, a distinct species, but only a variety of this red granite.

In the island of Ilva, on the coast of Tuscany, granite of this kind is found, but it is greatly inferior to the Egyptian in beauty and politure; the magnificent sepulchres of the great Dukes of Tuscany, in St. Lawrence's chapel at Florence, are of this stone.

Among the many sumptuous edifices, &c. built of this stone, the ruins whereof, as has been already observed, abound in Egypt, Asia, and Italy, the following monuments yet exist as witnesses of the antient magnificence, viz. the obelisk at Alexandria, called Cleopatra's Needle, or Pompey's Pillar, and another obelisk by it, which is now thrown down (6); the empty tomb or cenotaph in the great pyramid at Gize near Grand Cairo, it is seven feet long, two feet and eight inches over, and two feet and eight inches high (7), and the hall it is in is also all lined with this kind of granite (8); the inside of a temple at the village Baalbeit, between Damietta and Cairo, is all built with fine red granite; most of the granite stones therein are ten feet long, and five feet deep and

(4) Argenville Enum. foss. Galliaë, p. 26. Id. Oryct. p. 187. 204 & 413.

(5) Argenville Enum. foss. Galliaë, p. 497 & 498.

(6) P. Lucas's voyage au Levant, Tom. 2. p. 25. Pococke's description

of the East, Vol. I. p. 8.

(7) P. Lucas lb. p. 128.

(8) Ray's collection of travels and voyages, Vol. II. p. 432. viz. Mr. Greaves's account of the pyramids.

broad (9), and part of the sixteen pillars of the portico of the Pantheon at Rome (10), as also the obelisks in that city, are all of oriental granite (11).

The building with granite is of very great antiquity, and undoubtedly was first used by the Egyptians. Pliny observes (12), that all the obelisks were made of this stone, and that there were pillars of granite in the famous labyrinth of Egypt.

The antient names of this stone were *Syenites* and *marmor Thebaicum*, from the place where dug, and *pyropæcilon*, from its being spotted, as it were, with fire colour, or its red ground. Bellonius and other authors, I think with some reason, suppose it also to be the *saxum psaronium* of the antients (13), so denominated from its spots or variegations.

VII. *Granita pallide lutens maculis parvis nigris notata.*

This species bears a fine polish and good surface; it is of an agreeable pale yellowish colour, spotted with small irregular black spots, and is a very pretty stone.

Its texture is extremely fine, the concretions being very small, and exactly like grains of very fine sand, and when broken, it appears whitish and glittering, like a sand stone; these grains are of an opaque quartz, extremely compact, and very strongly concreted together; and the *micæ* are black, and lie irregularly in flakes of the bigness of grape stones.

This is a very rare granite. I have seen hitherto only small masses of it from the shores near Morlin Well, in the county of Donnegal in Ireland.

Mr. Tournefort, voyage to the Levant, Vol. I. Letter 7. p. 236. mentions to have seen pillars of granite at Constantinople, of a yellow dun, with here and there a spot of the colour of steel; and Dr. Pococke, in his description of the East, Vol. I. p. 147. informs us, that most part of mount Sinai in Arabia Petræa, is of granite of a yellowish ground, with small black grains in it: and Ib. p. 103. he also mentions a colossal statue twelve feet high, near Thebes in Upper Egypt, which he says is of a yellow granite, in very small grains, with some little flints in it. Undoubtedly the above granites mentioned by these authors, are of this species.

VIII. *Granita viridis nigro variegata.*

This bears a good polish and surface, it is of a fine grass green colour, thickly spotted with black, and is a very elegant stone.

The texture of it is more close and compact than usual, and the *micæ* are black and glossy, very thick set, and immersed in all directions.

(9) Pococke, Ib. 21.

(10) Montfaucon Diar. Ital. c. 12.

(11) Mercati de gli obelisch di Roma, c. 2. p. 4.

(12) P. 36. c. 8. *Trabes ex eo fecere reges quodam certamine, obeliscos vocan-*

tes, solis Numini sacratos — and l. 36. c. 13. *Columnis reliquis, e Syenite.*

(13) *Thebaicum, quem pyropæcilon appellavimus: aliqui psaronium vocant.* Plin. Hist. Nat. l. 36. c. 22.

This is also a rare granite, and is found in small masses or nodules, on the shores of this island.

Argenville, Oryct. p. 187. mentions a green and black granite, to be found on Monte Antico near Sienna in Italy; it probably is this species.

OBSERVATIONS on the GRANITES.

The name of granite, which this stone has now universally obtained, is a modern name, given it by the Italian writers, on account of its being concreted into grains, or of a granulose structure, and not compact and uniform as the marbles, &c. are, thence *granita*, i. e. *è granis composita*.

Most of the authors who treat on fossils, have confounded porphyry and granite together. Some have even given the name of granites to all marbles which are variegated with red, black, yellow, &c. spots, on account only of their being speckled marbles, without considering the characteristics of granites, viz. their granulose structure, and heterogeneous composition; other writers, indeed, have had regard to these two characteristics, and on that account have ranked, tho' erroneously, many quartzose stones with micæ, among the granites, without considering the other characteristics of growth, politure, &c; it is by these means, the history of the granites has been hitherto very erroneous: it is certain, that numbers of those nodules found on shores, which are composed of *micæ* and *quartz*, at first sight seem of the genus of granites: many rocks also, e. g. the Eddystone rock in Devonshire, is of the like nature, and most, if not all the true *lapis specularis* is imbedded in *quartz*, yet none of these stones are truly granites, as they, when attentively viewed, will be found to want some, if not most of the characteristics of that genus.

It is to be observed, that the granites in Wallerius's mineralogy (14) are injudiciously placed as varieties of the *porphyry*; which latter stone he further injudiciously ranges, as a species of *jasper* (15), for says that author, it is a kind of very hard red *jasper*; and adds, that these stones, i. e. the *granite* and the *porphyry*, are a-kin to the *jaspers* by their polish, otherwise, on account of their texture, they ought to be ranged among the *saxa* or *rock stones*. Linnæus (16) has no particular place for the *granites*, he does not even mention them, and his *concreta* (17) seems to be their rank with the *porphyry*, and various other stones. Woltersdorff (18) calls the genus *saxum*, but by his definition of the *saxa*, all the micaceous stones have equally place therein; and, to make the arrangement less perfect, he generously flings in the *porphyry* among them. Pott (19) likewise calls the *granite* a species of *Porphyry*. Such are the errors of these authors, and such must be the errors of authors who do not judiciously and attentively consider the bodies they treat on.

(14) Species 99.

(15) l. c.

(16) Syst. Nat.

(17) lb. Class 3. p. 185. Ordo I. Saxum.

(18) Systema minerale, p. 15.

(19) Lithogeognosie, Vol. II. p. 167.

The *grammitæ* of Langius (20) and Scheuchzer (21), found in plenty in large masses, as also in nodules in the rivers of Switzerland, and on mount St. Gothard, in the Canton of Uri, seem probably only nodules of granite, the *micæ* whereof being immersed perpendicularly to the surfaces of the masses, their edges only appear on the surfaces, and form lines, from whence they are so named by these authors. Perhaps likewise the *saxum quartzoso-cotaceum incarnatum squamis micaceis nigris decussantibus*, mentioned by Linnæus (22) to be found at Kalmora in Sweden, may be ranked with them.

The *variolites lucernensis* of Langius (23) and Scheuchzer (24) seems to be only a nodule of the *granite* kind.

(20) Hist. Lapid. fig. Helvetiæ,

p. 42. c. 5.

(21) Oryctogr. Helvetica, p. 109.

(22) Syst. Nat. p. 186. N°. 8.

(23) lb. p. 40.

(24) lb. p. 130.

SERIES II.

CHAP. IV. GENUS III.

The PORPHYRIES.

Stones of an exceeding fine compact uniform texture like flint, in which detached pieces or separate concretions of *quartz* are imbedded in all directions. The porphyries are of such excessive hardness, as freely and plentifully to strike fire with steel, they ferment not with acids, and are fusible.

I. *Porphyrites*.

PORPHYRITES seu *leucostictos*, vel, quorundam criticorum opinione, *Leptopsephos* Plinii Hist. Nat. l. 36. c. 7.

Porphyrites authorum, Scil. Kentmanni Nom. Foss. p. 54. N° 2. Gesner de fig. lap. p. 5. Aldrovandi Mus. Met. p. 751. Imperat. Hist. Nat. l. 25. c. 8. Boet. de Boodt de Gem. et Lapid. c. 281. De Laet de Gemm. et Lapid. l. 2. c. 25. p. 165. Wormii Mus. p. 44. Kircher Mund. Subter. l. 8. p. 86. Charlton de Foss. p. 247. Woodward's Meth. of Foss. p. 11. N° 40. Cat. of Foss. Cat. l. 74. Dale's Pharm. p. 47. Mus. Richter p. 186, 187 et 191. Woltersdoff Syft. Min. p. 15 et 47. Pott's Lithogegnosie, Vol. II. p. 164 et seq.

Porphyrites purpureus durissimus, maculis pallidioribus et albescentibus variegatus, qui Porphyrites antiquorum, Hill's Hist. Foss. p. 494. N° 1.

Iaspis durissima seu Porphyry rubens lapillulis albis. Porphyry. Leucostictos Plinii, Wallerius's Mineral. Species 99. Variet. 1.

Saxum impalpabile rufescens, punctis maculisque albidis, Linnæi Syft. Nat. p. 188. N° 22. and Ib. N° 21. *Saxum impalpabile nigrum punctis striisque spatosis rubris, vulgo Porphyrius*.

The *porphyry* is of a fine strong purple colour, thickly spotted with white, it takes an elegant polish and surface, and has always been highly esteemed for its great hardness and beauty.

The texture of the basis or purple part of this stone is very fine, compact, and uniform, like a jasper or flint, but nevertheless it always breaks with a rough irregular surface of no brightness. Intermixed and imbedded in it thickly, and in all directions, are white loose pieces, or separate concretions of *quartz*, and sometimes a very few, and hardly discernable flaky black specks or micæ; the white concretions are of an opaque glossy *quartz*, of a tabulated structure; they are generally small, and very thick set, and all of them, even the most minute, affect angular forms, approaching to oblong squares, cubes, or *parallelopipeds*, for the cubick form seems to be the figure this *quartz*, which is the *feld-spath* of the German writers, mostly affects in its crystallisation.

This is the general appearance of the true antient or Egyptian *porphyry*; but the *porphyry* nodules, found loose on the shores, &c. of Europe, slightly differ in the ground colour, which is generally of a fine deep brown, with a purplish cast, sometimes only of a dull brown, without any tinge of purple, and the spots are large, thinner set, and not quite so angular.

This stone is very heavy, and is of such extreme great hardness, that it exceeds in this quality all the other stones of strata known to me, and equals the *jaspers* and many other nodules of a crystalline basis, that can be workt only by emery, &c. in the lapidary way, and which intirely resist instruments of steel, or the mason's work.

This excessive hardness of the *porphyry*, and *ophites antiquorum* (likewise a species of *porphyry* hereafter to be described) and their resisting being work'd on by instruments of steel, or mason's tools, has planned a subject of debate among the learned, how the antients work'd the *porphyry* into the statues, columns, vases, &c. which we find among the remains of antiquity, and which astonish us, as the moderns find the utmost difficulty in cutting these stones. Many have, for that reason, imagined, that the antients had some method of hardning their tools, now unknown. Dr. Lister, who favours this opinion (1) says, that there is certainly something lost in this age, as to the manner of steeling of tools to work or grave on *porphyry*; and many, to retrieve this lost art, have, on what principle I own myself ignorant of, imagined a method (2) of hardening of tools to make them proper to cut *porphyry*, by steeping them in the juice of the plant called *bears breech*, or *brank-ursine* (3).

For my part, I doubt much if the antients were acquainted with any method of tempering their steel, in a superior degree to what we now do; I am apt to believe their continued assiduity and unwearied patience were the tools with which they performed their arduous work, joined to an accurate knowledge of the other materials, answerable to the nature of the stones they workt on.

I therefore give it as my opinion, that the temper the antients gave their steel, did not exceed ours; I shall further add, that I even believe it impossible to give steel such a temper as to work freely in the masons or statuaries way on *porphyries*, *jaspers*, or such like exceeding hard stones.

Before I proceed to give my conjecture, in what manner the antients work'd on this stone, it is necessary to inform my readers, that these works of *porphyry* are of the most early ages of the world, and of many centuries before the Grecian or Roman æra; for all the columns, statues, vases, &c. now known, are of Egyptian workmanship, nor does there appear any either Grecian or Roman works made of it; in like manner the *granite* was workt by the Egyptians; these were stones natural to their country, and indeed for that reason only, we have still remains of Grecian workmanship of the species of *granite*, described N^o. 3. supra, in the Archipelago islands and Asia Minor, for those countries abound with that stone; it even appears, that the *porphyry* was not greatly

(1) Phil. Trans. N^o. 203. The true way of making of steel, by Dr. Martin Lister. Lowthorp's abridg. Vol. II. p. 560.

(2) Vide Birch's history of the

Royal Society, Vol. I. p. 238. Vol. II. p. 73. *et alibi passim*.

(3) *Acanthus sativus*, *Carduus acanthus sive branca ursina botanicorum*.

esteemed in Rome, for Pliny (4) informs us, that Pollio brought statues of *porphyry* from Egypt, which example no one imitated, nor do I recollect that any of the classicks, except Suetonius (5), mention this stone; likely its great hardness might render it less agreeable to the Romans, if we consider the vast variety of fine marbles, whose colour far exceeded it, and were work'd with more ease.

The method this antient nation used to cut and engrave *porphyry*, to me seems to have been very simple, and without the aid of any scientific methods now lost. I suppose, that by unwearied diligence, and with numbers of common tools, at great expence, they rudely hewed, I may more properly express myself, in saying, broke the stone into the figure they intended, and by continued application, reduced those rude figures into more regular designs, which, when done, they completed the work by polishing it with great labour, by the aid of particular hard sands found in the country of Egypt. Might I hazard a conjecture in thinking, that, as in quarries of stone there are generally strata or layers of loose or disunited particles or grit, of the same nature as the quarry stone itself, there was likewise in the *porphyry* quarries layers of grit, or loose disunited particles, *analogous* to the *porphyry*, which they carefully sought for, and used for this work.

My conjecture to many may perhaps seem rash and trifling; but it is certainly otherwise, since some kinds of sands may be fit for some marbles, and others for stones of different kinds; in polishing marbles, or other stones of strata, the grain of them should always be considered, in order to apply such sands as answer most to the nature of their grit; this article is at present little considered, as artists at these times seldom work on philosophical principles, but we find the Romans thought it so important, that they fetched sands for the purpose of polishing, even from India and Ethiopia (6), and applied some kinds to the harder, and other kind to their softer stones, as their natures required.

The unwearied application and labour I grant to these early people, may also, perhaps, by some, be looked on as hyperbolical. I grant it seems, to surpass imagination, as indeed, many works we meet with, of the earliest times, and of rude wild nations, will also do; e. g. let any one consider with great attention the antient hatchets, darts, and other stone weapons and ornaments, used by the inhabitants of many places of the earth, before the use of iron was known to them, and as is yet the case of the savages of Nova Guinea, &c; attentively I say let us consider them, and with astonishment survey the hardest stones, even porphyries, basaltes, and *jaspers*, not only formed into hatches, knives, and other instruments with sharpened edges, but with their surfaces well polished and perfectly smooth, arrow heads of hard agats and flints curiously shaped and jagged to a scrupulous nicety, and the purest and finest crystal wrought, and exquisitely polished into spheres, sphaeroid, and orbicular forms, generally called *druid beads*, or *magical gems*, no one sure will allege, that these barbarous nations had a method of tempering steel, any knowledge of the lapidary art, or

(4) Hist. Nat. l. 36. c. 7. *Statuas ex eo Claudio Cæsari procurator ejus in urbem ex Ægypto advexit Vitrasius Pollio, non admodum probata novitate. Nemo certe postea imitatus est.*

(5) L. 5. c. 50. speaking of the place where Nero's body was deposited.

(6) Plinii Hist. Nat. l. 36. c. 6.

any methods now lost to effect these admirable works; yet that they did, and still make such works, is certain, and no doubt, only by such simple means as I ascribe to the Egyptians in their working of *porphyry*; it is therefore, by the mere efforts of the natural genius, and the unwearied diligence to prosecute what they undertook, that they accomplished works which these later ages, aided by wonderful scientific discoveries, view with astonishment, and are unwilling tho' not incapable of performing.

The antients had all their porphyry from Upper Egypt and Ethiopia, where there undoubtedly are vast strata of it; but I presume the antient quarries are now lost; for tho' quarries of porphyry are mentioned by travellers as yet existing with the antient quarries of granite, especially about ten miles north west of Esne on the Nile in Upper Egypt (7), yet I do not find proof sufficient to conclude that they are of porphyry, but am rather inclined to the opinion of Doctor Pococke (8), who says, that travellers do not truly distinguish porphyry from granite, so that it is probable these quarries, mentioned to be of porphyry, are indeed only quarries of granite.

Dr. Woodward informs us, that there are many vast strata and whole rocks of porphyry in Arabia Petræa.

Nodules of porphyry, worn smooth, and rounded by the working and agitation of the sea, are not unfrequently found on the shores of this island; I have seen very fine ones from Bardsey Isle, and the shores of Caernarvonshire, and other parts of Wales.

The masses exhibited by Dr. Woodward. Cat. A. * b. 1, 2, and 5. from Loo Beach, the Land's end, and the river Palmer in Cornwall, are all porphyry nodules; the Doctor notes, that there were several such nodules on the shores of the Land's end; and adds, that there are vast strata of stone of like sort in the country thereabouts, and particularly in the adjacent cliffs; but in my searches through that county, I must confess it never was my hap to meet with any strata of porphyry there, nor indeed in any other parts of England.

The masses also exhibited by the said author, Cat. B. p. 22x, p. 22†. and p. 22*. and Cat. E. b. 23. and 24. from the shores of Scarborough and Owthorn in Yorkshire, are likewise porphyry, and the angular form of the spots, no doubt, induced the Doctor to think, they probably were fragments of shells and other marine bodies; for oftentimes the spots really resemble parts of *entrochi*; and in the *ophites antiquorum*, or green porphyry, to be described, the spots being large, and much of the size of common *entrochi*, so greatly resemble those remains of *stellæ marinæ*, as might mislead any one to think them really such; the masses also from the shores of Sunderland, Cat. G. b. 16 and 17. of the said author are likewise porphyry nodules.

In France, Mr. Tournefort (9) mentions porphyry to be found in Provence, between Marseilles and les Pennes; there is also porphyry in the great forest of Esterle, between Canes and Frejus; and, according to Argenville (10), at

(7) Pococke's description of the East, Letter 5. p. 157. Vol. II. Letter 9. Vol. i. p. 112. P. 339.

(8) Ib. l. c.

(10) Oryctologie, p. 411, 468. &

(9) Voyage to the Levant, Vol. I. p. 495.

Puget and Roquebrune in the same country, at Fixin in Burgundy, and near Fougereais, half a league from Chateau Briant in Brittany.

In Switzerland, in the rivers Birsa, Emma, Sila, &c. nodules of porphyry like those on our shores are not unfrequently found; the *Silex marmoreus purpurascens coloris maculis candidis notatus ex Sila* of Scheuchzer Oryctogr. Helvetica, p. 129. is of this sort.

Bayer Supplem. Oryctogr. Noricæ, p. 44. informs us, that masses of porphyry are found scattered on the land in the territories of the imperial city of Nuremberg; and Bruckman, Epist. Itin. Cent. I. Ep. 37. p. 8. says, that porphyry is found on the mountains, and in the rivers of the duchy of Blanckenburg, in the circle of Lower Saxony.

In Sweden, according to Wallerius and Linnæus, porphyry is found at Oret, Hykie mountain, and Klitten, between Serne Elfdall and Mora in Dalcarlia, and at Gagne, near the cataract Mockfierd.

II. *Porphyrites saturate viridis maculis magnis oblongo-quadratis ex viridi albescentibus notatus, f. Ophites niger antiquorum.*

Ophites nigricans durus et Memphites Plinii Hist. Nat. l. 36. c. 7.

Verde Laconico, o verde Serpentino, Imperat. Hist. Nat. l. 25. c. 8.

Ægyptian marble, Grew's Mus. Reg. Sec. p. 316.

Marmor durissimum, obscure virescens maculis dilutioribus quadrangularibus plerunque nonnunquam partim ex viridi lutescentibus variegatum, Ital. Serpentino antico. Scheuchzer's Oryctogr. Helvetica, p. 122.

Ophites f. Serpentinus. Gesner de fig. Lap. p. 5. Aldrovand. Mus. Met. p. 752. Boet de Boodt de Gemm. et Lapid. p. 501. Worm. Mus. p. 43. Woodward's Meth. Foss. p. 11. N°. 39. Cat. Foss. Cat. L. specimen d. 2. Dale's Pharm. p. 47. Mus. Richter. p. 187 et 188. Pott's Lithogeognosie, vol. II. p. 164 & seq. & p. 177.

Serpentino Antico, f. orientale, Italice.

This kind of porphyry is of a fine deep grass green colour, thickly spotted or inlaid with large angular spots, mostly of an oblong square figure, generally of a light grass green colour, but sometimes whitish; it is capable of a very elegant polish and surface, and is an exquisite beautiful stone.

The basis or green part of this kind is of a much finer, compacter, or more jaspery texture than the common or red porphyry; but nevertheless like that it breaks into a rough surface of no brightness; the spots are of the opaque *quartz* or *feld-spath*, that always occurs in the porphyry and granite genera, and which in this stone is remarkably glossy, and of a very fair tabulated structure.

The regular angular figures and large size of the spots of this stone, have misled many to imagine (as I have already noted in my description of the porphyry) that they are *entrochi*, and other marine remains imbedded in it; but that they are quartzose, and not such remains, is evident from the simple experiment of their not being affected by acids.

The strata of this stone are in upper Egypt, tho' unknown at this time, the ancients had it thence, more especially from near the city of Memphis, from whence it obtained the name of *Memphites*; as Pliny expressly informs us.

I have already, in p. 209. and p. 269. of this history, given my conjectures on

on the three species of *ophitæ* of the antients; *scil.* the *tephrias* or *ophites cinereus*, which if not the X. species of *marmaro-proseron*, described p. 270. *supra*, is yet unknown to me; their *ophites candidus* probably is the Zœblitz or modern serpentine, described p. 266. N°. IX. and this species I think, with some certainty, may be concluded their *ophites niger*.

It is, I believe, needless to repeat, that the name of *ophitæ* were given to these stones, on account that their spots resembled those on the skins of some serpents as well as from the imaginary virtues attributed to them against the bites of those and other venomous creatures; these virtues, tho' handed down from the earliest times, are happily exploded by these more learned ages.

I presume, it will somewhat confirm the conjecture I hazarded on the manner the Egyptians cut porphyry, to observe, that there are no Grecian or Roman antiquities, no vases, statues, &c. of this stone; what pieces we find of it in the ruins of Italy, *e. g.* Rome, the Villa Hadriani, Tivoli, Puzzoli (where a temple of Serapis has lately been discovered) &c. are only small fragments such as tessellæ of mosaick pavements, incrustations, &c. that were brought by the Romans from the Egyptian ruins; for it is even reasonable to believe, that the antient quarries of this stone were unknown to them.

As among the ruins in Egypt no blocks of this stone of any great bulk are found, nor is it met with in any considerable quantity, we may probably conclude, that its strata were of no great extent and depth, or that the stone did not rise in blocks of any great bigness.

III. *Porphyrites obscure viridis albetibus minutis maculis pulcherrime adpersus fereque pictus apparens.*

Porfido verde orientale Italice.

Porphyrites viridis f. Leucosticton viride, vulgo quidem, sed minus recte. Mus. Richter. p. 188. 191, 192 & 198.

This species of porphyry takes a fine polish and surface, and is a very beautiful stone.

The ground, which is of a very dark blackish green colour, is thickly mottled with white specks; these colours appear as if dabbed or dotted on the stone, and exactly resemble the dabbings of the painters brushes on their pallets, for the loose white concretions, at first sight, do not appear distinct from or inlaid in the ground; but the whole stone seems a blended and very elegant variegated mass.

The concretions are of a fine milk-white opaque *quartz*, mostly very small and irregular, and the basis is of a fine, uniform, compact texture, breaking with a rough surface, but with no brightness.

This stone is met with in the ruins of Egypt, but not in any quantity; there are also pieces found in the ruins at Rome, and some few vases of it are preserved in that city, which, no doubt, were originally brought from Egypt by the Romans; the Italians very judiciously call it the oriental green porphyry, and conclude it an Egyptian stone, which undoubtedly it is, though the quarries or strata of it are lost to us.

IV. *Porphyrites*

IV. *Porphyrites obscure viridis.*

This kind is of a dull blackish green colour, thick set with small spots of a sullied white, mostly angular, and resembling those of the common or red porphyry, it takes a fine surface and polish, but is not a beautiful stone on account of the deadness or disagreeableness of the colours.

The constitution of this stone is much finer than the common or red porphyry, it does not also break with so rough a surface, tho' it is destitute of brightness; the concretions are of the opaque *quartz* or *feld-spath*, of a sullied or rusty white colour slightly glossy, and of a tabulated structure.

There are no strata of this kind of porphyry (to my knowledge) discovered as yet, but masses or nodules of it of various bignesses, are pretty frequently found on the shores of Flintshire, and other parts of Wales.

V. *Porphyrites variegatus.*

This porphyry is so greatly variegated with dark brown near black, white, flesh colour, yellowish and greenish, that it would be difficult to determine the ground colour to be dark brown, were it not apparently by its constitution, the basis of the stone, the other colours being only separate concretions of *quartz* lodged in it.

The texture of the basis is firm and compact, but is not so close or jaspery as the common porphyry; it breaks with a very rough surface, and is not quite destitute of a slight glittering or brightness.

The concretions or spots, which are very thick set, are all of the same kind of opaque *quartz* or *feld-spath* ever found in this genus of stones, and are only differently coloured; they are generally very glossy, and of a fair tabulated structure; but in their figures are vastly different from the spots or concretions in the other kinds of porphyries, these being extremely irregular, tending to round, and no wise angular, but form blotches of various sizes, which are sometimes so lengthened as to appear disposed into small veins.

This stone takes a fine surface and polish, and is, on account of its beautiful variety of colours, a very elegant species of porphyry.

Nodules of this stone are not unfrequently found on the shores of Wales, and other parts of England.

This kind undoubtedly is the *Porphirites durissimus, carneus, nigro viridi, et albo variegatus.* of Hill's Hist. Foss. p. 497. N^o. 3. which that author says is found in vast strata in Arabia Petræa and Upper Egypt, and is frequently met with in nodules in Germany, Ireland, our own shores, and in some parts of Devonshire far from the sea.

Wallerius, species 99. variety 2. proposes a *Porphyr purpureus, lapillulis diversæ coloris, Porphyrites*; which likely is this species.

OBSERVATIONS on the PORPHYRIES.

I have already taken notice in my observations on the granites, that Wallerius places those stones, as varieties of the porphyry, and the porphyry as a species

P P

of

of jasper; Pott indeed owns that the porphyries and jaspers have different properties, and are not of the same genus; that the basis of the porphyry is of a compact, uniform substance, near approaching to that of the jasper, is without doubt, but then the other properties of it widely differ from those of that stone; the porphyries are always found in strata, the jaspers only in nodules; the former have always detached *quartzose* concretions imbedded in them, the latter are uniform, and never have concretions of a different nature; certainly bodies differing in such strong characters demand different genera.

I have in this genus, which I call *Porphyrites*, named one of the species *Porphyrites viridis*; this term to some may appear contradictory, but as I have not adopted the name of *porphyrites* on account of the colour, but only on account that the chief species of this genus, the common or red porphyry has been known for a long series of ages by that name, I hope for excuse, and more especially as some like terms are daily used in this study, *e. g.* the white and yellow cornelian, the white sapphire, &c.

Ficoroni (11) mentions two exquisite fine columns of black porphyry, not to be matched by all the antiquities hitherto discovered, in a little church called *le tre Fontane* out of Rome, a mile farther than the *Basilica de S. Paolo nella via Ostiense*; he judges them to be Ethiopian, from whence the *basaltes* comes, whether these columns are truly porphyry or not, the learned at Rome must determine; however Wallerius, porphyry species 99, variety 1. the red porphyry, mentions also black porphyry, and the synonym of Linnæus's Syft. Nat. p. 188. N°. 21. which I have added to the red porphyry, calls that species found at Hykie mountain, between Elfdal and Mora in Dalekarlia, a black stone.

(11) *Le vestigia e rarità di Roma antica, &c. da Francesco Ficoroni*; his words are, “Nell altare della decollazione di San Paolo sono maravigliose le due colonne di finissimo porfido

“Nero, di cui in tutta l'antichità, non si trovano pari; non sapendosi quali Montagne le produssero, giudicherei essere d'Ethiopia, donde venne la Pietra Basalte.” l. i. c. 23.

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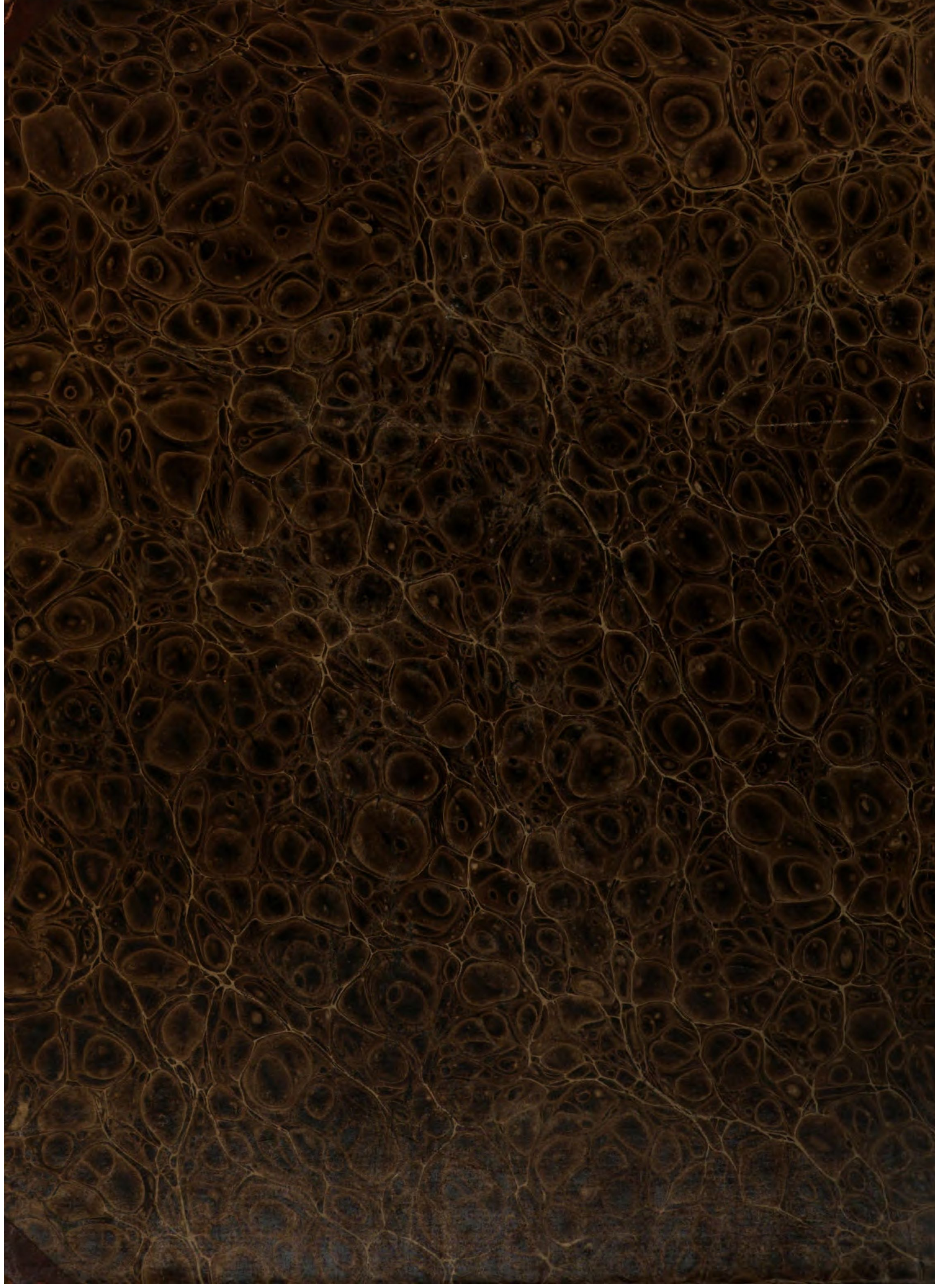
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F I N I S.



Mendes da Costa, Emanuel, 1717-1791

A Natural History Of Fossils

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